MEDICAL LIBRARY

DEC 3 1946

SURGERY Gynecology and Obstetrics

With International Abstracts of Surgery

VOLUME 83 December, 1946 NUMBER 6

The Hub of Protein Metabolism

Hub of protein metabolism is the liver. After the intestinal enzymes have completed protein digestion, the liver is the first station to which the portal blood carries the released amino acids in their complex journey. Their further fate is to a large extent shaped within the hepatic tissue.

This strategic position of the liver has a twofold relation to protein metabolism. When insufficient protein intake leads to tissue protein depletion, the liver becomes increasingly susceptible to such unfavorable influences as anesthesia, the impact of surgery, the arsphenamines. Even pregnancy with its increased metabolic demands may then produce a damaging effect.

The liver so affected gradually loses its power of producing albumin, fibrinogen, prothrombin, and probably also globulin.

Thus a cycle of deterioration is initiated: protein deficiency paves the way for impaired hepatic activity; in turn the liver fails to produce certain proteins needed in various vital functions.

Without a sufficient intake of biologically adequate protein, hardly any phase of metabolic life remains unimpaired.

An adequate amount of meat, with its biologically complete protein, will go far in maintaining protein nutrition. Meat supplies all the essential amino acids required by man, and is capable of satisfying every protein need.

The Seal of Acceptance denotes that the nutritional statements made in this advertisement are acceptable to the Council on Foods and Nutrition of the American Medical Association.

AMERICAN MEAT INSTITUTE

MAIN OFFICE, CHICAGO... MEMBERS THROUGHOUT THE UNITED STATES

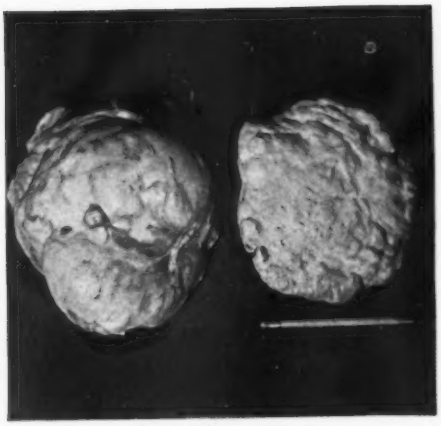


Fig. 1. Fibrosarcoma.

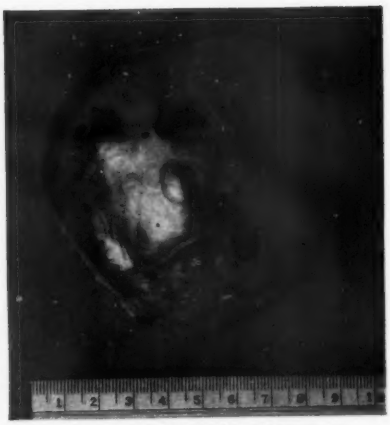


Fig. 2. Undifferentiated tumor.

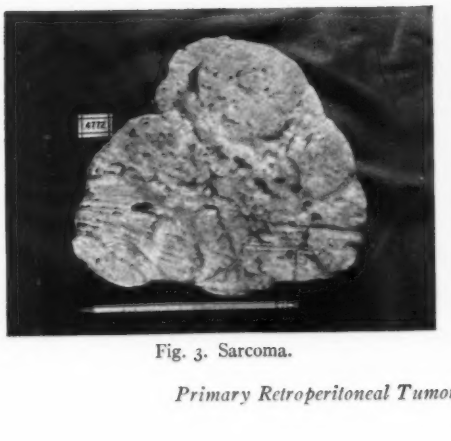


Fig. 3. Sarcoma.

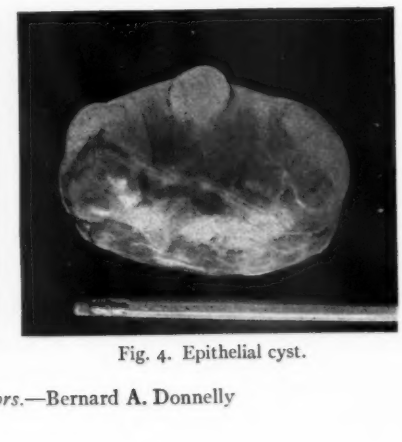


Fig. 4. Epithelial cyst.

Primary Retroperitoneal Tumors.—Bernard A. Donnelly

UNIV. OF

SURGERY
GYNECOLOGY AND OBSTETRICS

VOLUME 83 DECEMBER, 1946 NUMBER 6

PRIMARY RETROPERITONEAL TUMORS

A Report of 95 Cases and a Review of the Literature

BERNARD A. DONNELLY, M.D., Iowa City, Iowa

A GROUP of tumors arise independently in the retroperitoneal space and have no apparent connection with any adult structure save by areolar tissue (26). These tumors are known as primary retroperitoneal tumors. They do not include tumors of the retroperitoneal organs such as pancreas, adrenal or kidney, or metastatic tumors secondary to a neoplasm elsewhere in the body. Because of the close proximity of these tumors to the ureters and kidneys and the importance of retrograde pyelography (45) in their diagnosis, they have often been considered of primary interest only to the urologist. However, this group of tumors is also of special interest to the general surgeon who frequently is faced with the problem of making a differential diagnosis in the patient who presents himself with an unexplained abdominal mass. The primary retroperitoneal tumors often occur in such close proximity to the pelvic brim as to suggest a tumor of the genital organs, and the gynecologist at operation is occasionally confronted with a primary retroperitoneal tumor, after starting what was intended to be a routine gynecological operation. These tumors often occur in close proximity to vital abdominal structures, and for their excision abdominal surgery of considerable magnitude is required. It is, therefore, important that the general surgeon, the urologist, and the gynecologist have a clear, concise concept of this interesting group of tumors.

From the Department of Surgery, College of Medicine, State University of Iowa, Iowa City, Iowa.

In seeking information about the primary retroperitoneal tumors, never more than a brief paragraph or two is found in standard medical textbooks. For more detailed information one must turn to the literature and even this leaves much to be desired. A number of authors have presented information dealing with primary retroperitoneal tumors of a particular histologic type such as the sarcomas or lipomas. Some authors have reported primary retroperitoneal tumors of an unusual nature which they have treated, while others (16) have included in addition the tumors of the retroperitoneal organs. In only a few articles in the literature have these tumors been considered in their entirety.

The purpose of this paper is to present in a single article all of the available information about this particular group of tumors. The material presented in this paper was obtained by a review of the literature, and a review of 95 proved cases of primary retroperitoneal tumors which were treated at the University of Iowa Hospitals in a 20 year period from January, 1925 to January, 1946, inclusive.

The retroperitoneal space is located between the lumbar and iliac regions between the peritoneum and the posterior parietal walls of the abdominal cavity. The tumors originate in this space behind the posterior wall of the peritoneum. They may arise from the em-

bryologic urogenital cell ridge, adipose tissue, aerolar connective tissue, fascia, lymph glands, lymphatics, and sympathetic nervous structures. During their development they may raise any of the abdominal viscera away from the posterior abdominal wall, and, secondarily, the tumors may extend into the mesentery of the large and small intestine as well as downward, over or alongside the promontory of the sacrum, into the pelvic connective tissues and sigmoid mesocolon. They have grown into the inguinal canal (30), into labium and buttock (11), and through the obturator foramen (6). The tumors may be malignant or benign, single or multiple, solid or cystic, and may occur in either sex at any age in any race. Primary retroperitoneal tumors are unusual from the standpoint of origin, diversity of histologic types, and age incidence, and they present interesting problems of differential diagnosis, treatment and prognosis, in prognosis because the nonmalignant types are potentially malignant and prone to recur.

Historical. The first description of retroperitoneal tumors, according to Pemberton and Whitlock (41) was given by Morgagni in 1761. The older literature dealing with tumors not arising from any of the abdominal viscera appears to begin with Lobstein who in 1829 gave an accurate description of retroperitoneal growths. Retroperitoneal tumors were first discussed before a medical group at a meeting of the Southern Surgical Association in 1897, by Dr. Richard Douglas. Van de Veer in 1892 discussed the subject of retroperitoneal tumors before the American Surgical Association. Since Lobstein first used the term "retroperitoneal sarcoma" in 1829, the number of cases recorded in the literature has been constantly increased. Each case reported has added to the diversity of the histologic type of these tumors. Among the excellent articles in the literature are those by Pemberton and Whitlock (41), Mayo and Dixon, Hoch, Slagerman, Kretschmer (24), Lahn, Ransom and Kay, Hansmann and Budd, Frank (9), Judd and Larson, Carson, Miller, Golden and Stout, and Handfield-Jones.

Histogenesis. Until about 1880 these tumors were diagnosed as sarcoma or pancreatic cyst. In 1871 Howship observed a composite tumor in the retroperitoneal area which possessed certain characteristics similar to dermoid teratomas commonly found in the ovary. In 1889 Bassini described a retroperitoneal cystic adenoma similar to a cystadenoma of the ovary, and Frank (8) in 1894, observing a similar tumor, attributed its histogenesis to an accessory ovary. Hansmann and Budd in 1932 studied in detail 17 cases of primary retroperitoneal tumors, and found the histology of these tumors similar to that of tumors which arise in the adult urogenital apparatus.

On the basis of this study, Hansmann and Budd published an excellent article on the histogenesis of primary retroperitoneal tumors in which they came forth with the explanation that these tumors arise from remnants of the embryonal urogenital apparatus. On this basis they explained the wide diversity of histologic types of retroperitoneal tumors, and the fact that all well established tumors found in the adult urogenital organs have also been found occurring independently of adult organs in the retroperitoneal space.

From an embryological standpoint they present the manner in which these tumors may arise from remnants of the urogenital apparatus. They point out that when muscles and vertebrae form, the genitourinary structures are pushed forward. At this time bits of ectoderm may be carried forward with the genitourinary apparatus and may give an explanation for simple dermoids and epithelial cysts. They also point out that epithelial structures of various sorts extend from the fourth cervical vertebra to the pelvis during the embryological development of an individual. Some of these structures may not degenerate and later be involved in the origin of some of the primary retroperitoneal tumors of an epithelial type.

Hansmann and Budd also discuss the potency of mesothelium since it has been shown that the synovial membranes produce bone, adipose tissue, fibrous tissue, angiomatous and glandular tissue, and it is assumed that the mesothelium of the urogenital fold may account for the tumors with no particular characteristics which will associate them with a more definite embryonal structure.

This concept of the histogenesis of these tumors by Hansmann and Budd is in line with Cohnheim's (7) theory of fetal rests, in which he pointed out that one may discover small groups of embryonal cells that remain latent in various parts of the body under normal circumstances, and at a later time such small nests might begin to grow in response to some traumatic, or physiologic, but admittedly unknown, stimulus, and develop tumors.

It is also in line with Roberts' (7) theory of displacement which is to the effect that groups of cells might be displaced from fetal primordia during the development of a given organ, and then, in the new and alien environment to which they have been exiled, develop into tumors. Speeman's ideas concerning "organizers" or cells which act as a directive agent over other cells during the development of an organ, have given support to this. If displaced cells without an organizer to direct their development were stimulated to grow they would do so in the haphazard manner characteristic of tumors.

Gross characteristics. The primary retroperitoneal tumors may be solid, cystic, or a combination of both. The color varies from white (fibroma), yellow (lipoma), pinkish to red (sarcoma), depending upon the predominant tissue. The tumors may be single or multiple, and they may vary in size from small outgrowths to tumors which have weighed as much as 40 to 50 pounds. In a few cases bony or calcerous tissue predominates. Figures 1 to 4 (frontispiece) illustrate the gross appearance of various primary retroperitoneal tumors removed surgically at this hospital.

Histology. In a review of the literature a wide variety of primary retroperitoneal tumors showing a marked diversity of histologic types are found. A complete classification of all the primary tumors found in the retroperitoneal space would resemble a treatise on general pathology. Of the malignant tumors, the sarcomas were most frequent in occurrence, while the lipomas were the most frequent tumors of benign histology.

The lipomas deserve special mention because, although classified as a benign tumor, when they occur retroperitoneally, they show a tendency to undergo a malignant change. Pemberton and Whitlock described 30 cases of lipomas which came to the Mayo Clinic. Six of the patients died, 6 had recurrences, and 3 others had possible recurrences; a satisfactory result in but half the cases. Ten of the 30 lipomas at the time of initial histological examination showed a sarcomatous change.

Von Wahlendorf reports that in 165 cases of retroperitoneal lipomas, 14 per cent of the tumors showed a malignant change. Pemberton and McCoughan also report that in 42 patients with retroperitoneal lipomas, 14 per cent were undergoing malignant change.

The tendency to recur is also true of other tumors usually considered to be benign, namely fibromas and leiomyomas. Two explanations have been given for the recurrence of these supposedly benign tumors. The first is that there is more than one growth present and that the other smaller outgrowths are overlooked at operation and continue to grow and cause what is considered to be a recurrence after an apparently complete removal of the tumor. Von Wahlendorf, in removing a lipoma weighing 7,000 grams, during the final revision of the wound bed, discovered and removed 15 additional small growths. Miller reports the case of a patient with retroperitoneal lipomas from whom four separate masses, totaling 6,000 grams, were removed. Several masses had to be left behind due to closeness to vital structures. At autopsy tumor tissue weighing 5,800 grams was removed. Kanjan and Krivoborskaja found 3 unconnected tumors, soft fibromas of equal size, widely separated. The second explanation ventured by some authors for the recurrence of these tumors is that the tumors often contain a sarcomatous element which is missed through incomplete histological study.

The retroperitoneal leiomyomas, like the lipomas, are prone to undergo malignant change. Golden and Stout report a series of 8 patients with leiomyomas which arose in the retroperitoneal space. In 5 of these patients malignant changes were noted in the tumors, and in 3 patients metastases had taken place.

Lymphangiomas may occur in the retroperitoneal space but are quite rare. There are 7 such cases (22, 25, 36) reported in the litera-

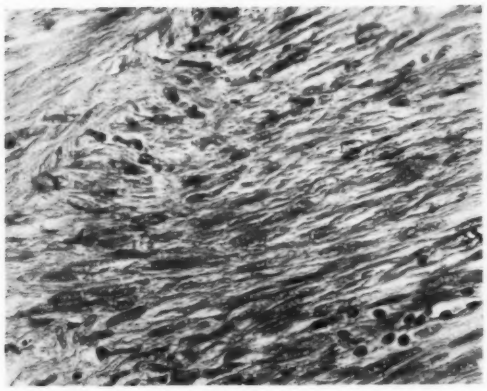


Fig. 5. Photomicrograph of section from retroperitoneal fibrosarcoma.

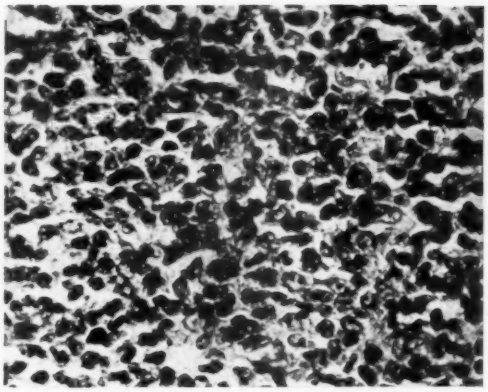


Fig. 6. Photomicrograph of retroperitoneal reticulum cell sarcoma.

ture. Of interest is that one of the tumors, occurring in the series of 95 cases in which patients were treated at the University of Iowa Hospitals, was reported histologically to be a cavernous lymphangioma.

The retroperitoneal cysts have been adequately described by Handfield-Jones. He classified them as cysts of urogenital origin, teratomatous cysts, lymphatic cysts, traumatic and parasitic cysts. The cysts are reported as occurring more commonly in women in the age period of 15 to 25 years, and most frequently on the left side. In general, the cysts are composed of a fibrous tissue wall, lined with a flattened epithelium. Retroperitoneal cysts are frequently diagnosed as ovarian cysts preoperatively.

A number of the tumors which arise in the retroperitoneal space cannot be definitely classified. These tumors are undifferentiated tumors which are highly malignant and do not show a definite histological pattern.

The most logical explanation of the diversity of histologic types found in the primary retroperitoneal tumors is their arising from remnants of the urogenital apparatus. This explanation is supported by the evidence that usually the tumors which occur in the adult urogenital organs have also been found arising independently in the retroperitoneal space.

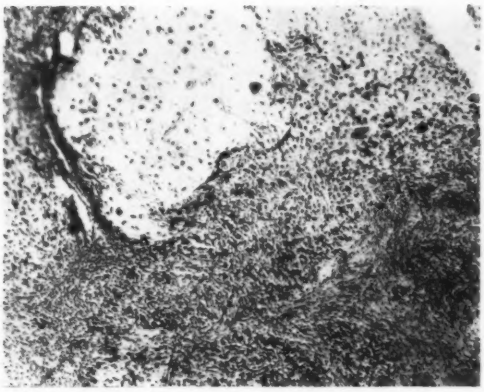


Fig. 7. Photomicrograph of retroperitoneal mixed cell sarcoma.

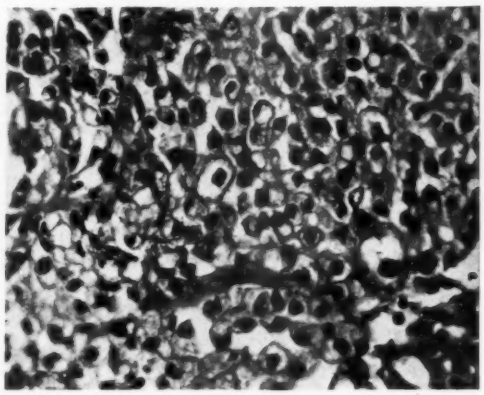


Fig. 8. Photomicrograph showing histological type resembling hypernephroma of the kidney.

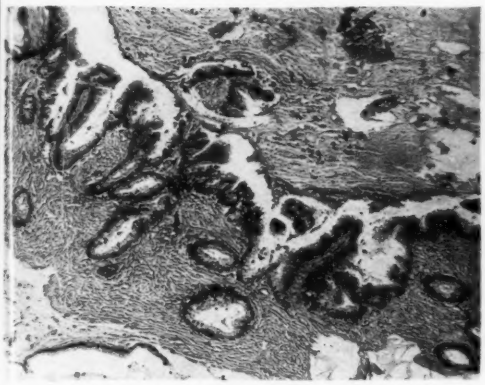


Fig. 9. Photomicrograph of retroperitoneal adenocarcinoma.

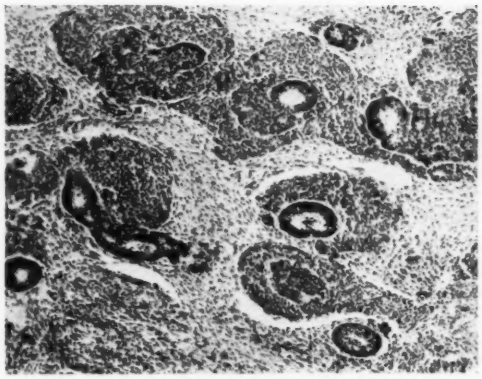


Fig. 10. Photomicrograph showing histological type resembling embryoma of the kidney.

To emphasize the diversity of histologic types of these tumors, photomicrographs of various primary retroperitoneal tumors surgically removed from patients treated at this hospital are shown in Figures 5 to 12.

INCIDENCE

Review of the literature reveals that a number of the authors refer to the primary retroperitoneal tumors as a tumor of infrequent occurrence. The small amount of material pertaining to these tumors in standard textbooks also indicates this same trend of thought. This, I believe, is an undeserved obscurity. For example, Mayo and Dixon stated that up to 1927 about 200 cases of primary retroperitoneal tumors have been reported in the literature. Pemberton and Whitlock in 1934 reported 200 cases of retroperitoneal lipoma. In 1937 Slagerman reported 144 cases of retroperitoneal sarcoma described in the literature. Frank (9) in 1938 reported 107 cases of varied histology reported in the literature between 1925 and 1936. There has been overlapping in some of the cases reported, but these cases plus the numerous cases of unusual histology reported make it safe to estimate that to date at least 500 cases of primary retroperitoneal tumors have been reported in the literature. Primary retroperitoneal tu-

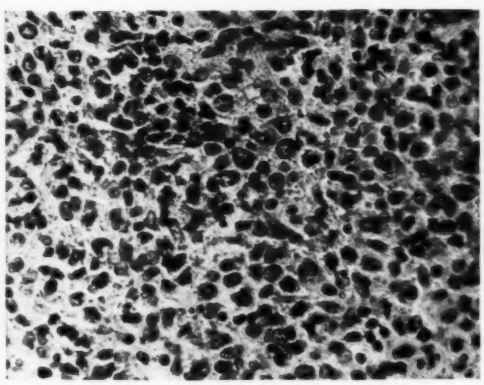


Fig. 11. Photomicrograph of undifferentiated retroperitoneal tumor.

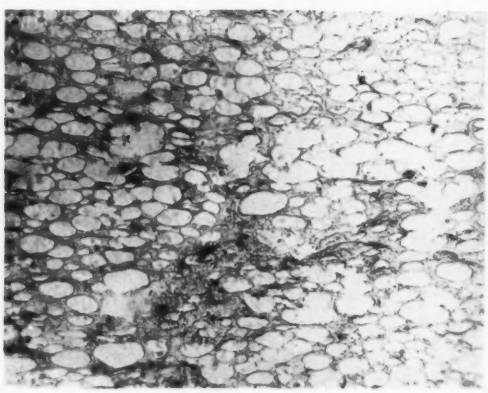


Fig. 12. Photomicrograph of retroperitoneal liposarcoma.

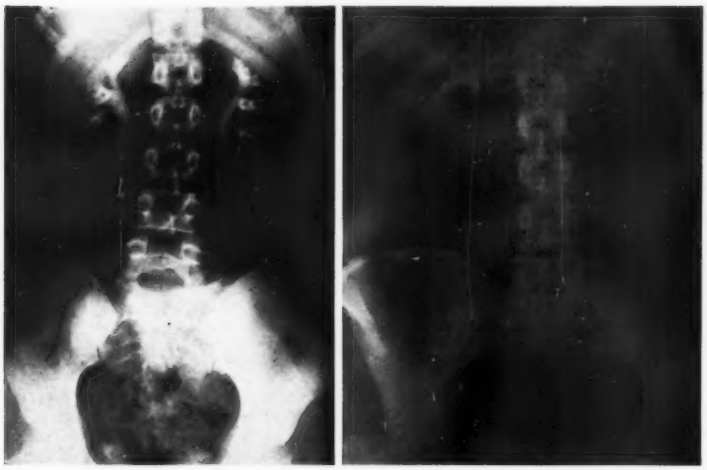


Fig. 13. Intravenous pyelograms of patients showing ureteral displacement by primary retroperitoneal tumor.

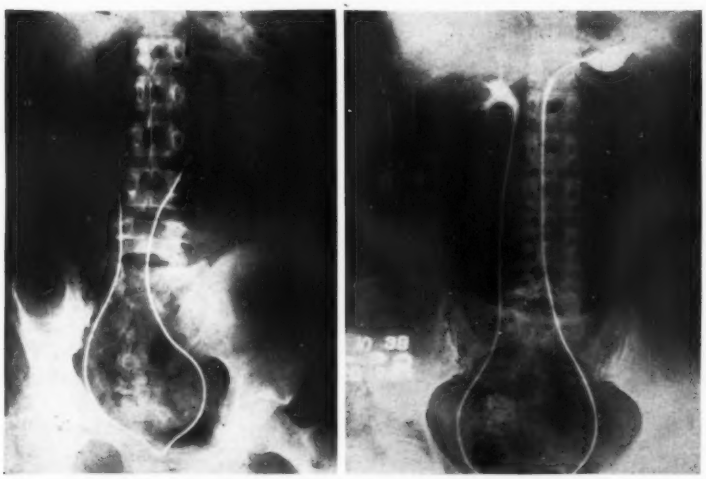


Fig. 14. Retrograde pyelograms of patients showing medial ureteral displacement by primary retroperitoneal tumor.

mors occur with sufficient frequency that they should always be considered in the differential diagnosis of an unexplained abdominal mass.

Primary retroperitoneal tumors reported in the literature occur most frequently in men at a ratio of approximately 2:1, and in the 4th and 5th decade. In the literature, insufficient emphasis is given to the occurrence of these tumors in the earlier age groups. More will be said about this in a discussion of the group o patients treated at the University of Iowa Hospitals.

SYMPTOMS

The early symptoms of primary retroperitoneal tumors are unfortunately vague, and none of the symptoms which occur can be considered diagnostic. The initial symptoms are usually vague digestive disturbances such

Fig. 15. Retrograde pyelograms of patients showing lateral ureteral displacement by primary retroperitoneal tumor.

as anorexia, eructations, heart-burn, and constipation. Progressive loss of weight and strength appears to be a universal rule. These symptoms have been considered to be due to pressure on the lymphatics of the digestive system, producing a partial obstruction of the vessels and interfering with normal digestive processes. In a few cases an accidental discovery of a mass in the abdomen was the first indication of any deviation from normal.

As the tumor mass increases in size, the symptoms are those of pressure, namely on the kidneys, ureters, and intestinal tract. The nature of the retroperitoneal tissues is such that expansion can readily take place, and the mass often is quite large before it is discovered. The history most typically received is that of indefinite pain in one or both lower quadrants of the abdomen, a progressive digestive upset with nausea and vomiting, constipation, loss of weight and strength, followed some 3 to 6 months later by discovery of an abdominal mass. In some instances acute abdominal symptoms due to intestinal obstruction, peritonitis, intra-abdominal rupture or hemorrhage have occurred. McLoughlin and Sharpe report a case in which the patient was admitted to the hospital and died in a few hours with uremia due to blocking of both ureters. Sweetser also reported a similar case. An unusual symptom described in the literature (15) is a difference in surface temperature of the two lower extremities as a sign of pressure of the growth on the abdominal sympathetics. Leichner reported glycosuria in a patient with retroperitoneal tumor due to pressure on the pancreas. Unilateral edema has also occurred as a symptom.

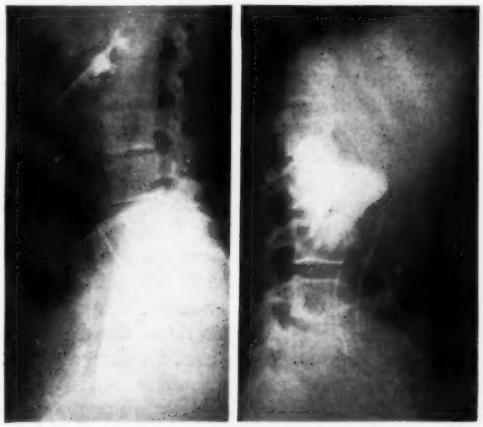


Fig. 16. Retrograde pyelograms of patients showing anterior ureteral displacement by primary retroperitoneal tumor.

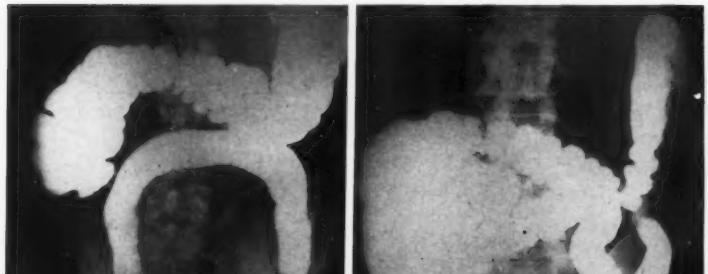


Fig. 17. Gastrointestinal roentgenograms of patients showing displacement of descending colon by primary retroperitoneal tumor.

DIAGNOSIS

The diagnosis of primary retroperitoneal tumors from other abdominal masses is mainly one of exclusion, and, provided a complete workup is performed, is not always the difficult problem indicated by some surgeons.

When a patient presents himself with an unexplained abdominal mass, consideration is given to tumors of ovarian, uterine, hepatic, intestinal, or renal origin. Primary retroperitoneal tumors should also be included in this differential diagnosis. The abdominal masses that most commonly need to be differentiated from primary retroperitoneal tumors are those of renal origin including hydronephrosis, polycystic disease, solitary cyst, kidney neoplasm and perinephritic abscess, or those of intra-abdominal origin, including tumors of the gastrointestinal tract, cysts of the pancreas, enlargement of the spleen, ovarian tumors, cysts of the omentum and mesentery, neoplasms of the liver, and urachal cysts.

To aid in this differentiation, x-ray examination of the gastrointestinal tract and pyelography of the kidney and ureters is invaluable. Occasionally an intra-abdominal tumor which is quite invasive or a markedly enlarged spleen will produce ureteral displacement usually considered characteristic of a primary retroperitoneal tumor. However, the urologists feel that in the majority of cases they can be quite definite in the diagnosis of a primary retroperitoneal tumor. This is based on the anatomical fact that the ureters are quite adherent to the posterior parietal layer of the peritoneum so that anything which displaces the ureter forward or to the side must necessarily be retroperitoneal. The following diagnostic aids are given by the retrograde pyelograms: (1) anteroposterior films will show deflection of the ureter laterally or mesially; (2)lateral films will show anterior displacement of the ureters; (3) the calices will be improperly filled due to pressure from the retroperitoneal tumor; (4) the pelvis of the kidney will be displaced, flattened, compressed, and rotated by the tumor mass; (5) muscle shadows may be obliterated; (6) displacement of the bladder may be noted. The urinary pyelograms shown in Figures 13 to 16 illustrate some of these pertinent diagnostic points.

It is found that retrograde pyelograms give more information and are of greater value in the diagnosis of a primary retroperitoneal tumor than are the intravenous pyelograms.

In reviewing the case of primary retroperitoneal tumors treated at this hospital, where the diagnosis was made on the basis of urinary pyelograms and a gastrointestinal series, the diagnosis was found to be remarkably accurate

The chief value of the gastrointestinal x-ray picture in the diagnosis of retroperitoneal tumors is the excluding of the gastrointestinal tract as the primary site of the tumor. Quite frequently if the tumor is of sufficient size, the x-ray film shows that the ascending or the descending colon is displaced from its normal position. Figure 17 illustrates this point.

While it is usually possible to reach a definite conclusion as to the retroperitoneal location of a tumor, often the exact nature is not disclosed until exploratory laparotomy is done.

It is believed that a preoperative diagnosis of a primary retroperitoneal tumor may be made in the majority of cases by careful work-up which includes x-ray examination of the gastrointestinal tract and retrograde pyelograms of the kidneys and ureters.

TREATMENT

Treatment of retroperitoneal growths consist of x-ray therapy, surgery, or a combination of the two. The trend of thought in the literature is that surgery offers the best prospect of permanent relief. In some cases, surgery is made imperative if such complications as intestinal obstruction, hemorrhage, or intraperitoneal rupture occurs. There are available two types of operation, the lumbar or extraperitoneal and the abdominal or transperitoneal. It is agreed that the extraperitoneal approach would avoid unnecessary shock and minimize the chance of peritonitis. However, this approach fails to fulfill the requirements of adequate exposure to remove these neoplasms successfully. A generous abdominal incision enables one to see the tumor clearly and to obtain better exposure, which is so essential in these tumors due to their proximity to vital abdominal structures. In the literature where such information was given, it was found that the transperitoneal approach was used in 95 per cent of the cases.

Immediate operative mortality is high. Surgical shock was the immediate factor producing death. The later complications include peritonitis, pneumonia, phlebitis, and pulmonary embolism. Frank (9) reported a difference in mortality dependent on the histology of the growth. The lowest mortality occurred in those patients with benign tumors such as lipomas and cysts, with the highest mortality taking place in patients with sarcomas and teratomas. Operative mortality reported in the literature varied from 16 to 25 per cent. Masson and Horgan report a mortality of 16 per cent. In the 107 cases reviewed by Frank (9), there was an operative mortality of 18.4 per cent. Pemberton and McCoughan (40) in a series of 42 cases, report a 20 per cent mortality. Von Wahlendorf in a series of 113 cases reported 25 per cent mortality. In the series of cases at the University of Iowa Hospitals the mortality rate was 19.7 per cent.

The retroperitoneal tumors are quite invasive and often become adherent to vital structures. Because of the odd and unusual locations in which these tumors are apt to be found, operations of considerable magnitude are often necessary to assure complete removal. At times, resection of the small intestine has been necessary. Judd, Counseller, and Hoerner (20) report a case in which they resected all but 30 centimeters of the terminal ileum in the excision of an extensive retroperitoneal tumor. In some of the cases the ureter or renal vessels have been torn, and nephrectomy was necessary. Frequently incorporation of vital structures within the mass prove to be insurmountable obstacles to surgical excision, and the inoperability rate of this particular group of tumors is high. Judd and Larson (21) in a review of 46 cases of retroperitoneal sarcoma, reported 32 per cent of the cases operable. Andrews of the Mayo Clinic reported an operability rate of 7.4 per cent. In the present series of 95 cases the operability rate was 35 per cent.

The concensus in the literature is that the treatment of choice is early operative intervention and excision of the tumor. Radiotherapy was found to be of value in prolonging life and improving the well-being of the patient, and most authors considered it of value postoperatively. Among these were Ockuly and Douglas who report favorable results in both operable and inoperable patients treated by x-ray. Judd and Larson report 30 of 32 patients treated by x-ray as being radiosensitive. Adair reports a patient with neurogenic sarcoma treated with x-ray as well 2½ years later. This is the only case reported in

which such favorable results have been recorded with x-ray therapy alone. In the review of histories of the patients treated at the University of Iowa Hospitals which follows, more detailed information will be given in reference to treatment of patients with primary retroperitoneal tumors.

METASTASES, RECURRENCES

Metastasis occurs frequently in the patient with a primary retroperitoneal tumor. Most authors in the literature report a metastatic rate of approximately 30 per cent except Frank who reported a rate of only 3.7 per cent in the cases reviewed by him. He also states that metastases are less common than local recurrences. However, this is not in agreement with other reports in the literature and with the patients treated at this hospital. Metastasis occurs most commonly in the lungs, liver, vertebrae, and regional lymph nodes, but have also occurred in the spleen, kidney, bone, spinal cord, and the adrenal.

The primary retroperitoneal tumors also have a high recurrence rate. Hosemann reported that of 7 patients operated upon twice, all died of recurrences. After a number of incomplete operations in which only a partial excision was possible, the patients have survived over varying periods of time. Lundblad performed 5 operations for recurrences in 1 case; the patient was alive 6 years after the last operation. Miller reported a case in which 3 operations were performed in 14 months for recurrence of fibromyomas histologically benign. Previous mention has been made of the tendency of tumors usually considered benign to recur, and this is especially true of the retroperitoneal lipomas which frequently undergo sarcomatous change.

REVIEW OF CASES TREATED AT THE UNIVERSITY OF IOWA HOSPITALS

Ninety-five patients with primary tumors of the retroperitoneal space, in which the diagnosis was proved by exploratory laparotomy, biopsy and microscopic study, or at autopsy, were treated in a 20 year period between January, 1925, and January, 1946, at the University of Iowa Hospitals. It is believed that this is the largest series of cases reported to date where all of the patients were treated at one hospital and an adequate follow-up was obtained in the majority of cases (85 of 95 patients treated). This is an average incidence of 1 case every 2½ months, and indicates an occurrence of sufficient frequency that these tumors can no longer be considered as a rare group of tumors. In addition, there were 14 cases in which a diagnosis of suspected retroperitoneal tumor was made on the basis of retrograde pyelography. For one reason or another, such as presence of metastases, or that the tumors were considered inoperable, the patients were not submitted to surgery. On the basis of past experience at this hospital, there is little doubt that an exploratory laparotomy would have confirmed the diagnosis. However, for purposes of accuracy, these cases were not included in this study.

Incidence. In this series of cases, the tumors occurred most frequently in males at the ratio of about 1½:1, and in the fourth, fifth, and sixth decade. The age incidence of these tumors is of interest and can also be of some diagnostic importance. Although the largest number of cases occurred in the fifth and sixth decades, as is the usual rule in malignant lesions, the important thing to emphasize is the high incidence of occurrence of these tumors in the younger age groups.

Thirty-nine of the tumors, or 42 per cent, occurred in patients who were under 40 years of age. The average age of the patients was 43.4 years, a much younger age average than in the usual malignancy. In a young patient with an unexplained abdominal mass, a primary retroperitoneal tumor should be seriously considered as a possibility in the diagnosis of the tumor mass.

Histology. In these patients the excised tumors also showed a wide variance in histologic type. This diversity of histologic type characteristic of primary retroperitoneal tumors is shown in Table I.

On the original examination 83 of the tumors or 87 per cent were considered malignant. Three of the tumors which were originally considered benign subsequently recurred which places 86 of the tumors, or 91 per cent, in a malignant category. Of the malignant tumors, the most common were the sarcomas,

undifferentiated neoplasms, embryoma, and adenocarcinoma. These 69 tumors comprised 81 per cent of the malignant tumors. Of the benign tumors the epithelial cysts were the most frequent in occurrence. There were fewer patients with lipomas in this series of cases than in those reported by the various authors in the literature.

Symptoms. The predominant symptoms in this series of patients were gastrointestinal in nature. The patients complained most frequently of indefinite abdominal pain in the lower abdomen, loss of appetite, constipation, and a feeling of nausea. Loss of weight and strength were invariably present. The average weight loss in these patients was 18 pounds. The above symptoms had been present from several months to several years before a mass in the abdomen was discovered either by the patient or by the doctor. In a few cases, accidental discovery of the mass was the first indication that the patient had of being ill. The average duration of symptoms in this group of patients before they presented themselves for treatment was 9.4 months.

Diagnosis. All of the above patients were admitted to the University Hospitals as diagnostic problems. The differential diagnosis usually centered on the gastrointestinal and genitourinary organs as the source of the tumor. The patients were admitted most frequently to the departments of medicine or urology. Occasionally female patients were admitted to the gynecology service. Up until approximately 10 years ago the majority of the cases were first seen by the surgeon in a consultant capacity. In the last 10 years, with emphasis being placed on giving the patient with an abdominal mass the benefit of exploratory laparotomy, more patients have been admitted directly to surgery. However, the majority of patients are still first admitted to the medical service and after a gastrointestinal series and urinary pyelography have been performed, the case is seen in consultation by the department of surgery. In those cases in which the patient was explored without urinary pyelograms, the preoperative diagnosis was most frequently an ovarian tumor in the female, and gastrointestinal malignant neoplasm in the male. Without the aid of a gastrointestinal series and retrograde pyelography, the preoperative diagnosis of a primary retroperitoneal tumor is a difficult one.

TABLE I.—HISTOLOGY OF PRIMARY RETROPERITONEAL TUMORS TREATED AT THE UNIVERSITY OF IOWA HOSPITALS

Malignant		Benign	
Histology	No. of cases	Histology	No. of cases
Sarcoma	14	Lipoma*	2
Fibrosarcoma	18	Fibroma†	1
Undifferentiated neoplasms	23	Myxoma‡	1
Adenocarcinoma	7	Lymphangioma	1
Embryoma	7	Serous cystadenoma	1
Adrenal cell carcinoma	3	Epithelial cyst	7
Renal cell carcinoma	1		13
Chorioepithelioma	2		
Teratoma	2		
Dermoid	2		
Lymphoma	1		
Neuroblastoma	2		
	82		

*One of the lipomas showed a sarcomatous change. The other case of lipoma had a recurrence three years later and sarcomatous change was present.
†Recurrence 13 years later with metastasis to chest.
‡Recurrence 1 year later.

Treatment. Thirty-three patients in this series are considered as having received no definite treatment of the tumor. These patients were either explored, found inoperable, and not given postoperative x-ray treatment, or were given only symptomatic treatment during their stay in the hospital.

Eighty-two of the 95 patients were submitted to exploratory laparotomy. Of these, 34 patients, or 35 per cent, were considered operable. Of the 48 inoperable patients, 22 received postoperative x-ray treatment. In addition, there were 6 patients who received x-ray therapy only and who later came to necropsy. This makes a total of 28 patients treated by deep x-ray therapy.

Twenty-one of the 33 operable cases were treated by complete excision of the tumor only and received no x-ray therapy at any time.

Thirteen patients were treated with a combination of surgery and deep x-ray therapy. Seven of these patients received x-ray therapy postoperatively. Six patients did not receive x-ray therapy until the original tumor treated by complete excision recurred.

In the 33 patients considered as having no definite treatment, 11 died postoperatively. In 8 the diagnosis was made at necropsy. Nine

patients died after leaving the hospital, living an average of 5.5 months. Two patients lived at least 1 year. In 6 instances no follow-up was obtained.

In those patients treated with deep x-ray therapy, 1 died postoperatively. The diagnosis in 2 cases was made at autopsy. Twenty-three patients died after leaving the hospital, living an average of 8.5 months. There were 7 patients who lived at least 1 year following their discharge from the hospital. The symptomatic improvement with relief of pain and an increased feeling of well-being was very noticeable in this group of patients following the completion of deep x-ray therapy. Inasmuch as these patients lived longer than did the previous group who did not receive x-ray therapy and because the symptomatic improvement in these patients was so marked, it is recommended that when a patient is explored and an inoperable primary retroperitoneal tumor is found he be given a course of deep x-ray therapy postoperatively.

In 22 of the 28 patients treated by deep x-ray therapy, it was possible to obtain an opinion as to the radiosensitivity of these tumors. Seventeen of the tumors, or 77 per cent, were considered radiosensitive in that there was a decrease in the size of the mass.

Twenty-one patients were treated by excision of the tumor. Of these cases, 4 died postoperatively. Four patients have since died who lived an average of 34 months following operation. Ten patients are still living and these patients to date have lived an average of 46 months since operation. In this group there are 7 patients who have lived at least 1 year and, of these, 5 patients are considered as 5 year cures. No follow-up was obtained on 3 patients.

Thirteen patients were treated with a combination of surgery and deep x-ray therapy. Five of these patients did not receive x-ray therapy until recurrence had taken place following excision of the tumor. Three of these patients lived at least 1 year after x-ray therapy was started. Six patients were treated with excision of the tumor followed by a course of deep x-ray therapy. Two of these patients have since died, having lived an average of 33 months following completion of therapy. Seven patients are still alive, 3 of which are considered as 5 year cures, having lived 6, 6½, and 9½ years, respectively. Two patients were alive 2 and 3 years, respectively, following operation at the time of the last check-up. One patient has just recently been discharged from the hospital. Complete excision of the tumor was possible in this case, and a good prognosis is anticipated.

Sixteen of the 81 patients who were operated upon, died postoperatively, giving an operative mortality of 19.7 per cent. Death was attributed to a variety of factors, namely: shock, peritonitis, intestinal obstruction, hemorrhage, and bladder paralysis. Four of the patients who died were admitted as emergencies with intestinal obstruction. Another patient admitted as an emergency with pain in the left flank and a temperature of 102 degrees revealed a retroperitoneal mass containing hair and pus. This mass was drained and the patient did well. Seventeen days later an attempt was made to remove the tumor. The abdominal aorta was nicked during the operative procedure. The patient died on the second postoperative day. Autopsy revealed a pelvic peritonitis and a thrombosis of the abdominal aorta. Histologically, the tumor was reported as a teratoma.

As one compares the various methods of treatment in this series of patients, it is found that the best results were obtained in those patients found operable and in whom complete excision of the tumor was possible. A comparison between those patients treated by surgery alone and those patients treated by a combination of surgery and postoperative x-ray therapy is difficult. However, when one considers that 10 patients treated by the above methods experienced a recurrence of the tumor, giving a recurrence rate of 33 per cent, and that 3 of these patients who were given x-ray therapy after the recurrence appeared lived an additional year, and that a large percentage of the tumors were sensitive to x-ray, it seems quite probable that if all patients treated by excision of the tumor had been given postoperative x-ray, an even better final result might have been obtained.

Metastases occurred with about the same frequency as did local recurrences of the tu-

mor. Metastases were present in 29 patients or in approximately 30 per cent of the patients in this series of cases. The most frequent sites of metastases were the liver, lungs, and vertebrae in that order.

SUMMARY

A group of tumors which arise independently in the retroperitoneal space unattached to any adult organ save by areolar tissue and known as primary retroperitoneal tumors have been described.

The origin of these tumors is considered to be best explained on their arising from remnants of the urogenital fold.

The tumors may be solid, cystic, or a combination of both; benign or malignant, and occur at any age in either sex in any race.

The tumors are predominantly malignant. Sarcoma is the most common malignant tumor. Epithelial cysts and lipomas are the most common benign tumors.

The tumors occur most frequently in males in a ratio of 2:1. They show a tendency to occur in the earlier age groups, with the patients showing an average age of 43 years.

The symptoms in the early stages are unfortunately vague and are primarily gastrointestinal in nature. As the mass increases in size, the symptoms are those resulting from pressure on adjacent structures and organs.

The diagnosis is made by exclusion. Retrograde pyelography showing characteristic findings of ureteral displacement and gastrointestinal x-ray series for excluding tumors of the gastrointestinal tract are the most valuable diagnostic aids.

Metastases and local recurrences occur with equal frequency in about 30 per cent of the cases. Metastatic lesions are most frequent in the liver, lung, and vertebrae.

The treatment of choice is operative intervention with as wide excision of the tumor as possible. Radiotherapy postoperatively in the operable and nonoperable cases is of definite value and should be routinely given.

REFERENCES

1. ADAIR, F. E. Ann. Surg., 1932, 96: 305.
2. ANDREWS, C. F. Surg. Gyn. Obst., 1923, 36: 480.
3. BASSINI. Quoted by Carson (5).
4. BETTMAN, R. B., and SERBY, J. Arch. Surg., 1932, 24: 300.
5. CARSON, W. J. J. Internat. Coll. Surgeons, 1940, 3: 331.
6. DEUPERT. Arch. klin. Chir., 1907, 82: 803.
7. FOOT, N. C. Pathology in Surgery. P. 48. Philadelphia: J. B. Lippincott Co., 1945.
8. FRANK, E. Quoted by Carson (5).
9. FRANK, R. T. Surgery, 1938, 4: 562.
10. GOLDEN, T., AND STOUT, A. P. Surg. Gyn. Obst., 1941, 73: 784.
11. GOUGH, A. J. Obst. Gyn., Brit. Empire, 1927, 34: 528.
12. HANDFIELD-JONES, R. M. Brit. J. Surg., 1924, 12: 119.
13. HANSMANN, G. H., and BUDD, J. W. Am. J. Path. Bact., 1931, 7: 631.
14. HARRINGTON, S. W. Surg. Clin. N. America, 1934, 14: 636.
15. HESSE, E. Quoted by Frank (9).
16. HOCH, G. F. J. Urol., Balt., 1944, 51: 128.
17. HOLDEN, W. B. Surg. Clin. N. America, 1931, 11: 1023.
18. HOWSHIP. Quoted by Hansmann and Budd (13).
19. INGRAM, C. B., and NELSON, J. M. Am. J. Obst., 1939, 37: 351.
20. JUDD, E. S., COUNSELLER, V. S., and HOERNER, M. T. Proc. Mayo Clin., 1934, 9: 425.
21. JUDD, E. S., and LARSON, M. Surg. Clinic N. America, 1933, 12: 823.
22. KAY, T. Glasgow M. J., 1908, 70: 112.
23. KIRACH, E. F., and WELLS, H. G. Am. J. M. Sc., 1920, 159: 356.
24. KRETSCHMER, H. J. Urol., Balt., 1940, 43: 61.
25. KRETSCHMER, H. L., and HIBBS, W. G. Arch. Surg., 1934, 29: 113.
26. LAHEY, F. H., and ECKERSON, E. B. Ann. Surg., 1934, 100: 231.
27. LAHN, L. J. Internat. Coll. Surgeons, 1943, 6: 461.
28. LEICHNER, W. Am. J. Surg., 1925, 39: 68.
29. LIVERMORE, G. R. J. Am. Ass. Gen.-urin. Surgeons, 1938, 31: 29.
30. LUNDBLAD, O. Quoted by Frank, R. T. (9).
31. MASSON, J. C., and HORGAN, E. J. Surg. Clin. N. America, 1921, 1: 145.
32. MAYO, C. H., and DIXON, C. Minnesota M., 1927, 10: 272.
33. MCFARLAND, J. Arch. Path., 1931, 11: 118.
34. MCLOUGHLIN, C. W., and SHARPE, J. C. Am. J. Surg., 1938, 41: 512.
35. MILLER, J. R. Am. J. Obst., 1936, 32: 652.
36. MILLMAN, M. J. Am. M. Ass., 1944, 124: 773.
37. N. England J. M., 1939, 220: 674.
38. Ibid., 221: 469.
39. OCKULY, E. A., and DOUGLAS, F. M. J. Urol., Balt., 1937, 37: 619.
40. PEMBERTON, J. DE J., and MCCOUGHAN, J. M. Surg. Gyn. Obst., 1933, 56: 110.
41. PEMBERTON, J., DE J., and WHITLOCK, M. E. Surg. Clin. N. America, 1934, 14: 601.
42. RANSOM, H. K., and KAY, E. B. Ann. Surg., 1940, 112: 700.
43. REGAN, J. S., SANES, S., and MACCALLUM, J. D. Ann. Surg., 1943, 117: 110.
44. SLAGERMAN, V. B. California West. M., 1937, 47: 110.
45. SWEETSER, T. H. J. Urol., Balt., 1942, 47: 619.
46. TROUT, H. H., and MEEKINS, G. E. Surg. Gyn. Obst., 1920, 31: 622.
47. WAHLENDORF, L. VON. Arch. klin. Chir., 1921, 115: 751.
48. WECHSLER, L. N. England J. M., 1932, 206: 1259.
49. WILLIAMS, C. J. Am. M. Ass., 1935, 105: 195.

PERFORATED GASTRIC MALIGNANCY

FREDERICK FITZHERBERT BOYCE, B.S., M.D., F.A.C.S., New Orleans, Louisiana

THE first reported case of perforated carcinoma of the stomach, which was recorded in the literature 122 years ago, has so many features of interest that it is worth repeating in some detail, especially as the original report is not always immediately available:

A 56 year old white male was admitted to the Hôpital de la Charité de Paris December 4, 1823, complaining of an ill defined mass apparently originating in the left lobe of the liver and said to have appeared following a violent blow over this area. His health had not been affected in any way. He had a good appetite, had never vomited, had had no fever, and was reasonably well nourished. Nothing about him, indeed, suggested that he might be suffering from a chronic illness.

For the first month of his hospitalization his condition remained unchanged, and he consumed about three-quarters of the food given him. The great Laennec, to whose service he had been admitted, doubted the existence of the mass and frankly classified the patient as a hypochondriac who was planning to take up winter quarters at the hospital.

January 1, 1824, the picture suddenly changed. The patient began to vomit, at first only early in the morning, later after the ingestion of any food. His skin became sallow and he began to lose weight. There was no change in the abdominal mass. Because of the vomiting Laennec now entertained the diagnosis of carcinoma of the stomach.

January 15 the vomitus became brownish and assumed a coffee-grounds appearance. January 19, about 5:00 a.m., immediately after taking some soup, the patient experienced sudden, very acute abdominal pain. An hour later, when he was examined by Laennec himself, his abdomen was greatly distended and extremely sensitive to pressure, and his facies had undergone a remarkable change. Now Laennec, wrote the recorder (Laennec's nephew), "fit ajouter à le feuille le diagnostice ce qui suit: *Ventriculos hodie ruptus est in loco scirrhi, et iam peritonitis adest et tympanitis peritonealis.*"

The patient's course was steadily downhill, not being altered in any way by the futile medications and external applications practiced at the time. Vomiting of coffee-grounds material became more and more profuse, the pulse grew steadily weaker, and while the abdominal pain diminished, the distention became more marked. The most striking feature of the case, however, was the emaciation which progressed with inconceivable swiftness almost from the moment of rupture; in the 6½ days which elapsed before death the patient passed from a status in which loss of weight was just becoming conspicuous to the "marasme des phtisiques les plus décharnés."

Necropsy confirmed the diagnosis of ruptured carcinoma of the stomach which Laennec had made an hour after the onset of symptoms. The abdomen contained about 2 pints of turbid, brownish-yellow fluid. On the posterior aspect of the stomach, near the lesser curvature, was a small elliptical ulceration, in the center of which was a small perforation. When the stomach was opened along the greater curvature the ulcerated area was found to be much larger than the external lesion suggested, and the gastric wall around it was thick and hard. The pylorus was not involved, but the malignant growth had replaced the normal tissue in large areas of the pancreas and liver.

In many respects the history of Laennec's patient is entirely typical of perforated gastric malignancy in its acute manifestations. There was a story of digestive disturbances which, though it covered only a brief period, pointed to a diagnosis of carcinoma of the stomach. Hematemesis was one of the symptoms, contrary to the rather general opinion that it does not occur in association with perforated lesions. Perforation occurred while the patient was in the hospital, in bed, under observation. The onset was typical of the onset in perforated peptic ulcer. The malignant disease was far advanced. Abdominal exploration was, of course, unknown in 1824, but had it been performed, obviously no curative procedure would have been possible, and the description of the tissue in the region of the perforation suggests that simple closure might also have been impossible. The enormous emaciation which occurred between the rupture and the patient's death 6½ days later is not typical as to time of occurrence and rapidity of progression but otherwise is entirely characteristic. Marked loss of weight, often to the point of extreme emaciation, is included as part of the history in the majority of reported cases.

Laennec's case, however, is completely atypical in one respect, the remarkable ac-

From Charity Hospital of Louisiana at New Orleans.

curacy of diagnosis, more remarkable, of course, because of the lack of diagnostic aids in the era in which it was made. In the 71 recorded cases of perforated carcinoma of the stomach collected by Aird in 1935 diagnosis had been made before operation or before necropsy in only 6 other cases, and it has continued to be missed in the majority of the cases reported since that date.

INCIDENCE

It is a surprising fact that in the 122 years which have elapsed since Laennec's case was recorded, less than 250 cases of perforated carcinoma of the stomach have been reported as such in the literature. Except for the 133 cases reported by McNealy and Hedin in 1938, most reports, from Laennec's in 1824 to those made in 1946, deal only with single instances or small groups, and are usually accompanied by a comment on the rarity of the accident.

Actually, perforation of gastric carcinoma does not seem to be unusual. The 8 cases reported by Aird in 1935 from the Royal Infirmary in Edinburgh were seen over a 10 year period, and the 133 cases reported by McNealy and Hedin in 1938 (in 17 of which the diagnosis was on clinical grounds alone) were collected from Cook County Hospital and Wesley Memorial Hospital in Chicago between 1925 and 1937. Numerous cases are also mentioned incidentally, in the course of reported series of cases of carcinoma of the stomach. Thus Bocharov, in a report of 1,020 patients treated at the Sklifossovsky (Central Oncologic) Institute of Moscow between 1928 and 1938, mentioned 44 instances of perforation. Raw, in reporting 312 personally treated cases of perforated peptic ulcer, casually remarked that he had also treated 3 cases of perforated gastric malignancy over the same period. The recorded incidence, according to Bisgard, who included these and other casually reported cases in his calculations, varies from 2.8 to 6 per cent.

The 36 instances of perforated gastric malignancy which I am presenting herewith were identified in an examination of the cases of gastric carcinoma which came to operation or autopsy at Charity Hospital of Louisiana at New Orleans between 1926 and 1944 inclusive; 17 were confirmed by operation, 19 by autopsy, and 6 by both methods. No statistical conclusions are possible, or are intended to be drawn, from so small a series, but the material seems worth presenting if only to emphasize further the fact that the accident is not rare.

The incidence of perforation of gastric carcinoma, on the basis of all the cases of that disease recorded in the Charity Hospital Record Library during the period studied, is approximately 2 per cent. For a number of reasons, however, the figure is unreliable. In the first place, only a small proportion of cases of carcinoma of the stomach come to autopsy at this institution; only 7 autopsies were performed for this disease in 1941, for instance, and only 4 in 1942, to select 2 recent years at random. In the second place, the percentage of operability during the 19 years covered by the study never rose above 40 per cent and was that only in a few years (5). Finally, although one can only speculate on the possibility, if all the cases diagnosed as perforated peptic ulcer were to come to autopsy, or if biopsy were done at the time of operation, I have no doubt that many of them would prove to be instances of perforated gastric carcinoma.

It might be added that the findings at autopsy in a number of nonperforated cases suggested that the malignancy would undoubtedly have ruptured shortly had the patient lived longer. Sometimes only the thin serosal layer separated the gastric contents from the peritoneal cavity, and the rupture occurred at the time that the organ was being manipulated.

Thirty-one of the 36 patients were male and 5 female, the disproportion being borne out by the sex incidence in the recorded cases. It is what might be expected, since gastric malignancy is more frequent in men than in women. Fourteen patients were white and 22 negro, but no special significance should be attached to the distribution, since the New Orleans Charity Hospital is the only institution, other than a small private hospital with limited facilities, in which negroes from a large section of Louisiana can be hospitalized.

The age range was wide, from 36 to 78 years, but in McNealy and Hedin's series it was even wider, from 27 to 80 years. The majority of patients in both series were over 45 years of age, again as would be expected, since carcinoma of the stomach, although not infrequent at much earlier ages, is most frequent in the upper age groups. Casberg, in an analysis of 7 cases of acute perforated gastric carcinoma from the St. Louis City Hospital, found that the average age of patients with perforations was 51 years, against an average age of 63 years for the 247 patients with gastric malignancy in the whole series.

DIAGNOSTIC CONSIDERATIONS

In the light of the clinical picture it is not difficult to explain the high proportion of diagnostic error in the recorded cases of perforated carcinoma of the stomach. Although a number of additional subclassifications have been suggested, the recorded cases fall readily into two chief groups, an acute group, in which the clinical picture is similar to the picture of perforated peptic ulcer, and a nonacute group, which McNealy and Hedin have correctly termed obscure. In the 79 cases analyzed by Aird, including the 8 cases added by him to the 71 already recorded in the literature, 66 per cent in which the histories were sufficiently detailed to permit classification fell into the acute group. McNealy and Hedin point out that in their series, which was almost equally divided between acute and obscure cases, the diagnosis was made 35 times in the 69 acute cases, against only 7 times in the 64 obscure cases.

Of the 33 cases in the Charity Hospital series in which the histories were adequate enough to permit classification, only 9 were acute, and 6 patients died without ever presenting symptoms in any way referable to the gastrointestinal tract. The diagnosis was made correctly only 5 times before operation or autopsy, and it is significant that 4 of the 5 correctly diagnosed cases were in the acute group. The number of obscure cases and the failure of diagnosis in so many instances are readily explained by the location of the rupture. As in other reported cases, it appeared in various areas of the stomach, but in only 12 cases did it occur into the free peritoneal cavity. In 9 instances the rupture was into the liver, in 7 into the pancreas, in 4 into the omentum, and in 4 into the transverse colon. In 2 cases of rupture into the pancreas, the lumen of an eroded blood vessel in the base of the malignant growth communicated with the splenic pedicle. In 8 instances rupture had occurred sufficiently long before operation or autopsy, which usually meant also sufficiently long before the patient was first seen, for a well defined abscess or abscesses to have formed. Multiple liver abscesses were present in 3 cases, and diaphragmatic abscesses in 2 others. There were, however, no ruptures into the lung, such as occurred in 2 cases in McNealy and Hedin's series.

The clinical picture in most of the cases compounded the confusion. In 23 of the 33 cases in which a reasonably complete history could be secured it was possible to obtain a more or less clearcut story of symptoms referable to the gastrointestinal tract, though by no means always referable to the stomach. In 3 cases the history was typical of peptic ulcer. Curiously, however, the single case of "cancer on ulcer" found at necropsy was not included in this group, nor was another case in which, adjacent to the malignant perforation, was an old gastric ulcer 6 centimeters in diameter.

In 16 cases the duration of symptoms was less than 6 months, and in 13 it was less than 3 months. In 4 cases it covered only 4 weeks. It was notable that in many cases habitual pain or other habitual symptoms had been considerably increased, sometimes for as long as 2 weeks, before the patients were hospitalized, even in cases in which acute pain typical of acute perforation was not present. Hematemesis occurred in 7 cases, melena in 3, and both symptoms in 1. Profuse hematemesis occurred in an additional case, 24 hours after jejunostomy, which had been done because the patient, who weighed only 92 pounds, was in too poor condition to withstand any other procedure. Postmortem examination revealed a malignant ulceration 4 centimeters in diameter on the lesser curvature, slightly posteriorly, which had apparently just ruptured into the liver. Although the history covered only 2 months and the

malignancy was a slow-growing adenocarcinoma, the stomach wall was almost completely rigid, in many areas it was 1 centimeter in thickness, the omentum was involved, and Virchow's node was present. The case suggests a case recorded by Friedenwald and McGlannan in which perforation occurred 2 months after gastroenterostomy for inoperable gastric carcinoma.

Two patients had symptoms suggestive only of cardiac disease, which they actually had and for which they had been under treatment in the medical clinic for almost 2 years; neither had symptoms referable to the abdomen. One patient had had a cataract operation 3 months before and another a hysterectomy 4 months before; digestive symptoms were present at these times in both cases, and failure to investigate them must be set down as a serious diagnostic error. One 36 year old patient had been hospitalized 3 months earlier and had left against advice, before diagnostic studies were completed; his symptoms were then thought to be due to a peptic ulcer. Another patient, hospitalized for almost 3 months before death, had very indefinite symptoms; postmortem examination revealed widespread metastases and surgery could have accomplished nothing curative, but the mere presence of a positive blood serologic reaction seems rather doubtful grounds for the consulting surgeon to suggest antisyphilitic therapy for possible syphilis of the stomach.

Seventeen of the 36 cases were diagnosed as carcinoma of the stomach, in many instances considered too far advanced to warrant even exploration. Fifteen cases were variously diagnosed as acute cholecystitis, duodenal ulcer, intestinal obstruction, and carcinoma of the esophagus, lung, pancreas, and colon. Although perforated peptic ulcer is the most frequent diagnosis recorded in the literature, the fact that it was made only 4 times in this series is undoubtedly to be explained by the very small proportion of acute cases. Actually, if the diagnosis of gastric malignancy has not been established or suspected before perforation occurs, it is not likely to be made afterward, there being nothing to differentiate a perforated malignant from a perforated benign ulceration.

The following by no means atypical history indicates the possible difficulty of diagnosis in a nonacute or obscure instance of perforated carcinoma of the stomach:

A white male, 62 years of age, had suffered for a year from malaise, constipation, and severe discomfort in the lower abdomen. During this period he had lost 50 pounds. A month before he entered the hospital his constipation increased, his appetite became very poor, and he could feel a mass in the left abdomen. All other symptoms were specifically denied. Examination revealed a greatly emaciated, elderly man, whose only significant physical finding was a tender mass, about the size of the fist, in the left abdomen, just lateral to the umbilicus, and apparently not connected with either the spleen or the left kidney.

The tentative diagnosis was carcinoma of the colon versus neoplasm of the left kidney. Barium enema, which revealed a partially obstructing lesion in the transverse colon just to the left of the midline, about 6 centimeters in diameter and almost encircling the bowel, seemed to confirm the diagnosis of carcinoma of the colon. At cystoscopy, however, it was impossible to enter the left ureter.

After adequate preparation the abdomen was explored under spinal analgesia. The mass was found to be the result of a rupture into the transverse colon of a gastric malignancy over which the omentum was plastered. Gastrectomy combined with resection of the transverse colon was followed by death within 20 hours.

McNealy and Hedin offer as a partial explanation of the unusually high proportion of correctly diagnosed cases in their series the fact that many patients were in hospital when rupture occurred and that the diagnosis of carcinoma of the stomach had already been made. Three patients in the Charity Hospital series had been in the hospital for periods ranging from 48 hours to 7 days when rupture apparently occurred. The mere fact of hospitalization, however, does not necessarily hasten diagnosis nor does it always save the patient. In 2 patients in the Charity Hospital series operation was performed at once, in 1 instance on the correct diagnosis. The other patient, who was recognized as having an acute abdominal condition, could never be brought to proper condition for operation; his general status made him almost a hopeless risk and the outcome can fairly be regarded as inevitable. In this connection Vale and Cameron's warning is worth remembering, that patients who perforate in the hospital

seem to have less chance of recovery than patients who enter with the perforation because the accident is likely to be overlooked; 2 of the 9 cases they report to prove their point were instances of perforated gastric malignancy.

It has been suggested that the sequence of trauma and acute symptoms should suggest the diagnosis. McNealy and Hedin have sufficiently detailed data to permit the statement that in their series almost half of the perforations occurred while the patients were working or walking or exerting themselves strenuously; 1 was cheering at a ball game. I have no such data in my own series, but trauma may possibly have been a factor in 3 instances. One patient was walking rapidly, 1 experienced symptoms shortly after he fell out of bed (in the hospital), and 1 had just concluded a meal and was pushing the table away from him. Diagnosis was made correctly in only the first case. In a fourth case acute symptoms ensued shortly after roentgenologic examination with a barium meal and it is possible that perforation can be explained, as in the ruptured duodenal ulcer reported by Paas under the same circumstances, as the result of overloading the stomach with the contrast meal, which caused increased motor activity, with contractions of the longitudinal and circular muscle fibers. The suggestion was added that the manipulations of the abdominal wall incidental to fluoroscopic examination possibly played a subordinate rôle.

TREATMENT

As in all reported series, the therapeutic picture in the perforated gastric malignancies which occurred at the New Orleans Charity Hospital is extremely sad. Four patients were moribund and died without operation within a few hours of admission. Thirteen others died without operation within periods ranging from 3 days to 30 days. Of the 16 patients who underwent surgery, 3 were submitted to exploration, 3 to closure of the perforation, 3 to gastroenterostomy, and 3 to gastrectomy, in 1 instance combined with resection of the colon. Two patients were submitted to jejunostomy and 1 each to gastrostomy and to incision and drainage of an abscess between the stomach and the liver.

Only 6 patients survived to leave the hospital, only 2 of whom had been submitted to gastrectomy. The fate of 1 of the only 2 patients who had any chance of permanent survival is unknown. The other died in the hospital 28 months later, following 4 months' hospitalization, during which time he was treated by repeated paracentesis for massive ascites. Postmortem examination revealed a lung abscess, metastases to the regional lymph nodes, extensive involvement of the liver and generalized peritoneal seeding. Of McNealy and Hedin's 133 patients only 63 were operated on, only 13 left the hospital alive, and only 5 of them had been submitted to gastrectomy.

Primary gastrectomy, as Bisgard and Overmiller have recently advocated, is unquestionably the ideal procedure, though I cannot share their optimistic view that the majority of carcinomas which perforate are small, relatively localized, and therefore suitable for resection. As a matter of fact, of the 17 patients who came to autopsy at Charity Hospital without operation, only 1 presented a growth suitable for resection under the most liberal circumstances. The surgical diagnosis was leaking carcinoma and the fact that the medical staff did not concur was merely an academic consideration, since the patient, who died 4 days after admission, was obviously not a candidate for surgery because of inanition and cachexia.

The point is correctly made by Bisgard and Overmiller, as a further argument for primary gastrectomy, that simple closure, while it may be the logical procedure because of the patient's poor condition, is difficult and sometimes impossible because the sutures cut through the rigid and friable tissues. In the Charity Hospital series, as a matter of fact, 1 resection was done in desperation because the suture would not hold, but the fact that the patient died on the table at the conclusion of the operation carries its own lesson.

I should be willing to accept Bisgard and Overmiller's thesis that the hazard of gastrectomy in a diffusely soiled cavity has been overestimated and the hazard of leakage from a sutured perforation much underestimated, but no amount of reasoning hurdles the

obstacle presented by the patient's condition. Aside from the 4 moribund patients in the Charity Hospital series, 21 others were stated to be poor surgical risks, or could be so classified from the data on the chart, and only 1 patient in the whole series was stated to be a good risk. At operation or autopsy 27 were found to have extensions of the growth or extensive metastases and only 1 was stated to be free from them. Emaciation—3 patients weighed, respectively, 93, 92, and 63 pounds when they were first seen—hepatomegaly, ascites, jaundice, and similar complications can fairly be regarded as contraindications to gastrectomy. Finally, Bisgard and Overmiller, while pointing out that the mortality in the recorded cases is lower for gastrectomy than for any other procedure, by admitting that perhaps only favorable cases are reported seem tacitly to agree with Aird's conclusion from that same presumption, that the recorded mortality is therefore entirely artificial.

If primary gastrectomy is not feasible, the next most rational procedure is to close the perforation, on the ground that the surgeon's immediate business in such cases is to keep the patient from dying, and then to get him into shape for deferred gastric resection. A few such cases have been recorded. Fleming does not record the end-result of gastrectomy 18 days after closure of the perforation. Brunschwig and Heinz, who performed gastrectomy 3 months after the first operation, report that the patient was still well at the end of 10 months. But Haines, who performed the second operation after 9 weeks of intensive preparation, found an inoperable malignancy and lost the patient a few days later. My own—admittedly gloomy—opinion is that in the majority of cases perforation occurs when the disease is too far advanced for any hope of cure, and that the only optimism warranted lies in the not very hopeful prospect of detecting carcinoma of the stomach far enough in advance to extirpate the disease and thus prevent perforation by removing the soil for it.

RUPTURE OF METASTATIC GASTRIC MALIGNANCY

The following case, which is not included in the 36 instances of perforated malignancy just discussed, is recorded as an instance of gastric perforation associated with an extension of pancreatic malignancy:

A 65 year old white male had a 3 year history of abdominal pain and alternating constipation and diarrhea. He had vomited at occasional intervals for the past 5 years. During the 3 months before admission to the hospital all symptoms had been much worse, he had almost completely lost his appetite, he had become very weak, and he had lost 20 pounds. There was a somewhat inconclusive story of jaundice lasting 48 hours during this period. The physician whom the patient had consulted shortly before he entered the hospital had found a mass in the abdomen and had made a diagnosis of carcinoma of the stomach.

The patient was emaciated, anemic, and cachetic. In the right epigastrium was a large mass, about the size of an orange, firm, and freely movable. Gastrointestinal examination with an opaque meal showed a constant large filling defect at the pylorus and 60 per cent gastric retention at the end of 6 hours. Barium enema suggested a possible filling defect at the hepatic flexure. An Ewald test meal showed no free hydrochloric acid and a total acidity of 22.

The patient was intensively prepared for surgery, which was undertaken on the probable diagnosis of carcinoma of the stomach. At operation the posterior surface of the stomach was found adherent to the pancreas and as an attempt was made to free the adhesions, the stomach almost amputated itself, as the result of a friable malignant process which completely encircled it. Rupture had already occurred into the pancreas. Metastases were present in all the regional lymph nodes. The involved segment of stomach was resected. The patient died 3½ days later. Postmortem examination showed the head of the pancreas practically replaced by a very firm mass 7 by 7 by 4.5 centimeters, which histologic examination revealed to be primary adenocarcinoma of the pancreas, of which the malignant process in the stomach was an extension.

SUMMARY

Although only a small number of cases of perforated carcinoma of the stomach have been reported, the condition is by no means rare. Diagnosis is not usually made before operation or necropsy; acute cases are likely to be regarded as perforated benign ulcer unless the malignancy has been recognized before the accident, and obscure cases are likely to be atypical, and may present symptoms not related to the gastrointestinal tract. Primary gastrectomy is the ideal procedure but is usually impossible because of the advanced stage of the disease and the poor condition of the patient. The only solution of

the problem therefore seems to be diagnosis and treatment of the gastric malignancy before the perforation occurs.

A series of 36 cases is reported from Charity Hospital of Louisiana at New Orleans, and an additional case is reported of perforation of metastatic gastric malignancy which represented an extension from primary adenocarcinoma of the pancreas.

REFERENCES

1. Aird, Ian. Brit. J. Surg., 1935, 22: 545-554.
2. Bisgard, J. Dewey. Surgery, 1945, 17: 498-509.
3. Bisgard, J. Dewey, and Overmiller, W. Ann. Surg., 1944, 120: 526-530.
4. Bocharov, A. A. Am. Rev. Soviet M., 1944, 1: 532-539.
5. Boyce, Frederick F. N. Orleans M. & S. J., 1944, 97: 217-227.
6. Brunschwig, A., and Heinz, T. E. Am. J. Surg., 1936, 32: 508-510.
7. Casberg, Melvin A. Arch. Surg., 1940, 41: 937-944.
8. Fleming, B. L. Ann. Surg., 1937, 105: 630-633.
9. Friedenwald, Julius, and McGlannan, Alexius. Am. J. M. Sc., 1919, 157: 1-5.
10. Haines, Charles. Rev. Gastroenter., 1941, 8: 239-241.
11. Laennec, Mériadec. Observations de la Clinique de M. le Professeur Laennec, Recueillies à l'Hôpital de la Charité. Rev. méd. fr. et étrangère, et J. Clin. l'Hôtel-Dieu et la Charité Paris, pp. 379-384. Paris: Gabon et Compagnie, 1824.
12. McNealy, R. W., and Hedin, R. F. Surg. Gyn. Obst., 1938, 67: 818-823.
13. Paas, H. R. Deut. Zschr. Chir., 1936, 247: 461-494. Abstracted in J. Am. M. Ass., 1936, 107: 2096.
14. Raw, Stanley C. Lancet, Lond., 1944, 1: 12-14.
15. Vale, C. Fremont, and Cameron, Duncan A. Ann. Surg., 1936, 103: 353-361.

TREATMENT OF UTERINE PROLAPSE AND HERNIATIONS INTO THE VAGINAL VAULT BY THE "COMPOSITE" PROCEDURE

ROBERT C. AUSTIN, M.D., F.A.C.S., Dayton, Ohio

THE many operations that have been advocated for relief of uterine prolapse and accompanying herniations into the vaginal vault are in themselves proof that the perfect treatment has not yet been evolved. All of these operations have their place in treatment of individual patients, all have been successful in selected cases, but all have proved inadequate in many instances. The Spalding-Richardson composite procedure, which combines features of a number of operations that have been successfully used, each in its own field, is therefore a welcome addition to the techniques available for treatment of this complicated syndrome. The writer prefers it to other operations in first and second degree prolapse. In third degree prolapse he may choose either the composite procedure or vaginal hysterectomy, with utilization of the prevaginal (pubocervical) fascia to re-enforce the bladder support.

SYMPTOMS AND FINDINGS

Patients who present themselves with the prolapse syndrome have a fairly well standardized series of complaints, though an occasional patient has amazingly few symptoms referable to her anatomical defects. Presenting complaints include bearing-down sensations, "falling out of something," sensations of pressure or of ballooning on straining, soreness and pulling sensations of the lower abdomen, backache, frequency and urgency of urination, nocturia, pain or burning on urination, difficulty in starting stream or in emptying bladder, incontinence of urine, constipation, vaginal discharge, sometimes bloody, nervousness, fatigability, and in young women, usually menstrual disorders. Most of the symptoms are aggravated by being on the feet, and as a rule relief is secured on lying down.

Analysis of the records in this series of 84 cases reveals that 33 patients had first degree uterine prolapse (in which the cervix reaches the level of the ischial spines), 42 had second degree prolapse (in which the cervix appears at the vulva), and 6 had third degree prolapse (in which the cervix or uterus protrudes through the vulva), while 3 had no uterine prolapse. There is a certain correlation between the degree of prolapse and the degree of cystocele and rectocele. Usually, the prolapse is slightly less severe than these herniations into the vaginal vault, though the reverse is true occasionally. In one of the 3 cases without prolapse, there was a second degree cystocele and no rectocele. In the second case both cystocele and rectocele were of first degree, while in the remaining case both were of second degree.

All the patients suffered with cystourethrocele—11 of the first degree, 59 of the second, and 14 of the third. There were only 4 who escaped rectocele; in 4 the severity was first degree, in 67 second degree, and in 9 third degree. Enterocele was present in only 1 case, although in 11 there was relaxation or deepening of the cul-de-sac which made it advisable to close the uterosacral ligaments.

Cervical lacerations were found in 32 cases, and perineal lacerations in 43. Tumors or polyps or both were found in 27 cases. Urinary infections of varying severity were present 18 times, and pelvic infections which ranged from severe ulceration to mild chronic cervicitis 68 times. Sixteen of the patients were markedly obese, but severe malnutrition and obvious polyglandular deficiency were each observed only once.

ANATOMICAL BASIS OF OPERATION

In a condition which causes the descent of so many organs, the surgeon's problem in-

volves first the replacing of these organs in their normal position, and then the best use of surrounding anatomical structures to maintain them in this position. It is necessary, therefore, to give some consideration to the anatomical basis of the surgical therapy employed.

The system of supporting structures is highly complex. It is musculofascial in nature, and the fascia is practically continuous throughout its extent, so that its point of origin cannot be definitely stated. The foundation of the system, of course, is the pelvic floor. This floor is composed of layer on layer of muscle and fascia. Beginning at the perineal aspect, the most superficial layer is fatty, but with fibers which bind it firmly to the deep layer of superficial (Colles') fascia. Between the Colles' fascia and the lower fascial investment of the urogenital diaphragm is the superficial perineal compartment. Within it lie a number of superficial muscles and other structures which, except for the external anal sphincter, are not pertinent to this study. The sphincter surrounds the anus just beneath the skin, and has a prominent extension which is attached at the coccyx. This muscle is joined anteriorly by fibers of the superficial transverse perineal muscles.

The urogenital diaphragm (triangular ligament) is composed of the so called urethral sphincter and the deep transverse perineal muscles, invested by two layers of fascia which often are of aponeurotic strength. Though described as triangular in shape, this diaphragm has an extension to the coccyx which lies superior to the coccygeal extension of the sphincter and inferior to the coccygeal attachment of the levatores ani. The muscles and fascia of the diaphragm, as well as the Colles' fascia, send out fibers which intermingle with the intrinsic muscle fibers of the pelvic viscera, and firmly attach them to the pelvic floor.

Directly above and in apposition to the urogenital diaphragm in the median half lie the levator ani muscles, with their fascial investments. These muscles are paired, and consist of two definitely separate portions—the more anterior pubococcygeus and the median iliococcygeus. Sometimes the posterior coccygeus is included in the group. Together they completely close the pelvic outlet. Since only the pubococcygeus comes into contact with the pelvic viscera, it is this muscle that is most often damaged by childbearing, and which concerns us in treatment of prolapse and associated herniations.

The pubococcygeus has been described as a hammock which is slung across the pelvis. As a matter of fact, its most anterior fibers insert into the lateral walls of the urethra, binding them closely to the pubic bones. Other more lateral fibers insert into the vagina and are lost in its intrinsic musculature. Median fibers become tendinous and interdigitate with the smooth-muscle fibers of the rectum. The posterior fibers pass to the coccyx, where they are underlaid by the attachments of the iliococcygeus.

The superior fascia of the pelvis (rectovesical fascia), which overlies the levatores, turns upward on the three hollow viscera to form a fascial sheath, or collar. The collar around the urethra spreads out to form a covering for the bladder. That which surrounds the vagina extends upward on the uterus to the level of the uterine arteries and veins, and becomes continuous with the fascial sheaths of the vascular compartments that traverse the broad ligaments. Above this level the endopelvic fascia on the uterus thins out and completely disappears on the portion clothed by the peritoneum. There is thus a firm musculofascial collar surrounding each of the pelvic viscera, and a double layer of fascia between bladder and vagina and between rectum and vagina. It is through these musculofascial collars that the organs herniate into the vaginal vault to form rectocele and cystocele.

In such cases the fascia often becomes stretched and thinned out in the center, though normal tone usually is preserved in the lateral portions. It follows, therefore, that cystocele can be relieved by imbricating the relaxed fascia over the bladder and snugging up the strong lateral portions of the prevaginal layer. In order that this may be done, it is necessary to free this layer first from its attachments to the bladder fascia and then from the vaginal mucosa as far laterally as may be

required to reach the normal area. When the incision is closed, the fascia is coapted and sutured as a separate layer.

Rectocele is a somewhat different problem. In addition to stretching of the vaginal wall over the herniation, lacerations of the perineum have permitted the tissues to slip to the sides. Thus the direct support normally given to both rectum and vagina by the perineal body is lost. Restoration involves separation of the vaginal wall from the rectal fascia, reattachment of the rectal fascia to the vaginal wall well above the weakened portion, and reconstruction of the perineum by bringing together and suturing firmly the median fibers of the pubococcygeus muscles. Subcutaneous perineal tissues are brought together in the midline and sutured, and the skin is closed in such manner as to transform the original transverse incision into a longitudinal closure. The redundant section of the posterior vaginal wall is excised, and the wall is closed to form a normal introitus.

Above the superior fascia of the pelvic diaphragm (rectovesical fascia), there are a number of supporting structures. Except for the round ligaments, they are continuous with the fascial collars of the pelvic viscera and also continuous with each other. Their peripheral attachments are all lower than their attachments to the uterus, so that their function is not so much to uphold the uterus as to maintain its normal position within the pelvis.

These structures include the uterosacral ligaments which extend on each side from the posterolateral aspect of the cervix around the rectum to the sacrum. Their function is to hold the cervix back in the posterior part of the pelvis, and thus co-operate with the round ligaments to prevent uterine retroposition.

Laterally the uterosacrals blend with the heavy transverse cervical ligaments (cardinal or Mackenrodt ligaments), which in turn are continuous with the vascular sheaths contained in the broad ligaments. They merge medially and inferiorly into the fascial collars of the vagina and bladder. The cardinal ligaments spread tentlike toward the lateral pelvic walls, where they insert into the obturator fascia and the superior fascia of the pelvic diaphragm.

The misnamed "round ligaments" do not appear to be continuous with the endopelvic fascia. They are not round, but are flat musculofascial bands which are attached broadly at the anterior surface of the uterine cornua above the fascial collar. They traverse the broad ligaments to enter the anterior pelvic wall, pass through the inguinal rings, and terminate in a diverticular process in each of the labia majora. Their function is to return the uterus to its normal moderate anteversion after physiological displacement by a full bladder or by intrasomatic pressure. Often they are poorly formed and inadequate, and fail to perform their function well. For whatever value they may have as a support, in the composite operation they are severed from the uterus and sutured into the angles of the cervical segment which is retained.

So long as the pelvic floor is intact, the endopelvic fascia and ligaments as a rule play their part adequately in maintaining normal position of the pelvic viscera. Since, however, they are dependent for their medial anchorage on the integrity of the pelvic and urogenital diaphragms and the musculofascial collars derived from them, laceration or sagging of these diaphragms at once impairs their functioning. If, in addition, they are congenitally imperfect or are weakened by long-continued subnutrition, they quickly lose elasticity and tensile strength. In some women the tissue weakness is so marked that prolapse occasionally is seen after only slight stress during labor and even in virgins.

The term "broad ligaments," strictly speaking, is a misnomer. It should be recalled that the peritoneum covers and is firmly attached to the fundus of the uterus. Laterally it is draped over the uterine tubes and the ovaries. Between these folds of peritoneum, in addition to subserous reticular tissue, are found the nerves and blood vessels in their own tough fascial sheaths (continuous with the cardinal ligaments and the uterine collar), the round, uterosacral, and cardinal ligaments, the uteroovarian and infundibulopelvic ligaments. It is to this compound structure that the term "broad ligaments" is commonly applied.

In a vaginal panhysterectomy this group as a whole is severed from the uterus and brought

together to form a support for the bladder. Unless it is securely sutured and re-enforced by coapting the uterosacral ligaments and closing the anterior vaginal fascia as a separate layer, there is danger that an intestinal herniation through the stumps of the ligaments may develop subsequently. In the composite operation the bases of the broad ligaments are not disturbed, because the segment of the cervix to which they are attached is not removed, and the danger of intestinal herniation is greatly reduced.

From the fundus of the uterus the peritoneum dips downward anteriorly to invest the upper vesical surface, leaving a shallow depression or fossa between bladder and uterus. At this point the peritoneum is accessible when the bladder is freed from its attachments to vagina and cervix, and here the incision is made through which the uterine body is delivered for hysterectomy or fundectomy.

Posteriorly the peritoneum descends on the uterine wall to a considerable depth, then rises to invest the rectum and the uterosacral ligaments, thus forming the pararectal fossa (cul-de-sac of Douglas). Between the ligaments there is a weak spot where the peritoneum and rectum lack adequate fascial support. At this point there may be an intestinal herniation (enterocele) into the cul-de-sac. The enterocele may appear in the posterior vaginal fornix, or it may burrow down between the rectal and vaginal collars of fascia until it reaches the rectocele almost always present in such cases. Then the two herniations become so firmly compacted that the diagnosis of enterocele may be entirely missed until the operation is under way. Since the two uterosacral ligaments form the superior lateral boundary of the cul-de-sac, bringing these ligaments together and suturing them firmly (after amputation of the hernia sac) will fill in the defect and prevent further herniation into the cul-de-sac.

We have the picture, then, of three hollow viscera surrounded by musculofascial collars derived from the supporting pelvic floor. The uterus is directly supported by the vagina and by the uterine extension of the vaginal collar of fascia. Indirectly it is supported by the pelvic floor. It is held in place more or less firmly by ligaments extending outward to the pelvic wall anteriorly, posteriorly, and bilaterally. Sagging or tearing of the pelvic floor obviously changes the relative position of the organs supported by the floor. The vagina and hence the uterus sink downward. The bladder and rectum are tilted toward the center, so that they lean against the vagina. Thus there is bulging and thinning of the fascial layers between the organs, and also a constant pull on the attachments of the vagina and cervix. This tends to draw these structures downward and thus to bring about further retroversion of the uterus. It can then no longer perform its normal function of deflecting intrasomatic pressures, and gradually is pushed downward by these pressures into the vaginal canal, further dragging down on its attachments to bladder and rectum. Intestinal loops gravitate into the space over the bladder formerly occupied by the uterus, and their weight accelerates the process of herniation through the vaginal wall.

In cases of prolapse, it is probable that the uterus often is subinvoluted. Certainly many times the cervix is diseased, elongated, and edematous. Tumors also are frequently present. The excess weight of the abnormal tissues doubtless aggravates the prolapse. Reduction of weight and extirpation of diseased tissues may be accomplished either by panhysterectomy or, as in the composite procedure, by amputating the cervix and removing the corpus uteri or fundus. The remaining segment of the cervix may be coned out thoroughly to remove the endometrium and preclude the development of malignant tumors or the endometrium may be left intact when it is desirable to preserve some function. The segment of the cervix retained has a rich blood supply, and is the portion to which the broad and uterosacral ligaments are attached. It is therefore not only safe but advantageous to leave it in place.

From this description, it can be appreciated that each component part of the operation has a sound anatomical basis, and it remains only to organize the procedure in a logical sequence. Since the technique is shown in detail by the illustrations and their legends, further discussion here is omitted.

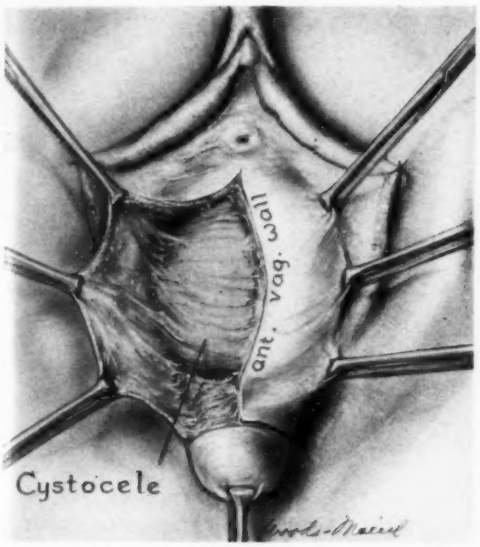


Fig. 1. After diagnostic dilatation and curettage are done, downward traction on cervix and upward lateral traction on anterior vaginal wall flatten out site of incision. Longitudinal incision is made through vaginal wall, extending from about 1 centimeter below urethra to cervix. If cervix is to be amputated, incision encircles cervix. Vaginal cuff is stripped upward, and vaginal wall is separated by sharp and blunt dissection from fascial covering of bladder. Diseased portion of cervix is excised. If patient is past or near menopause, endometrium is completely removed from cervical segment by endotherm conization.

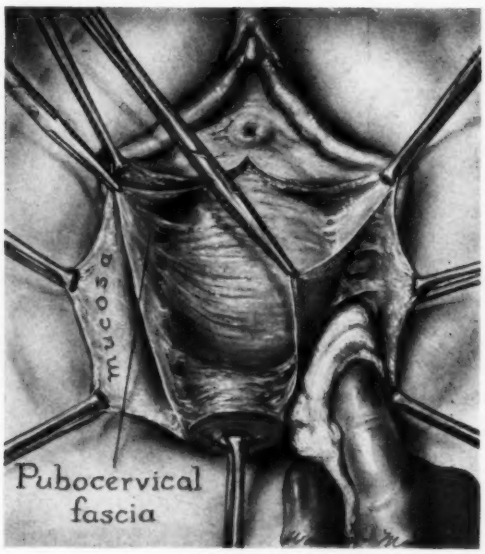


Fig. 2. Flaps of vaginal wall are placed under uniform tension by clamps. Prevaginal fascia is incised and separated from vaginal mucosa by blunt dissection, carried well out on each side.

ADVANTAGES AND DISADVANTAGES OF OPERATION

The advantages of the composite operation are manifold: (1) It is flexible enough to meet the needs of the individual patient. Thus the cervix may be left intact, may be coned out, or may be amputated, while either a supracervical hysterectomy or a fundectomy may be performed. Endometrium may be entirely extirpated, or enough may be left to permit some function. Adnexa may be removed or left *in situ*, and the perineum may be repaired or not as required. (2) Unhealthy tissues or those that are the potential site of future disease are excised. (3) Weight carried by supporting structures is reduced. (4) Normal anatomical relationships are restored. (5) The segment of cervix preserved has an ample blood supply, and the ligaments attached to it

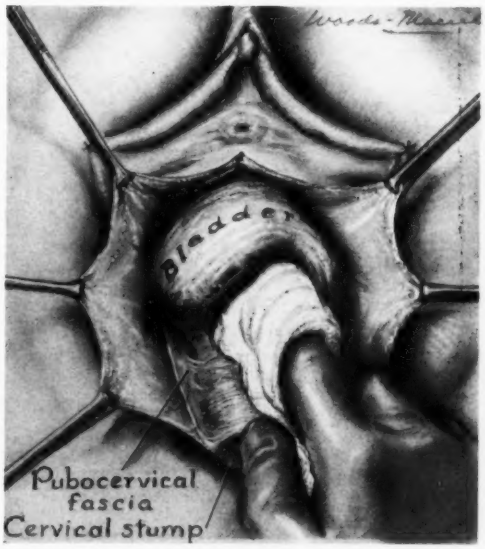


Fig. 3. Separation of bladder from cervix is started with Mayo scissors and carried upward with index fingers, following plane of cleavage between vesical and uterine fascia, until vesicouterine peritoneum is exposed.

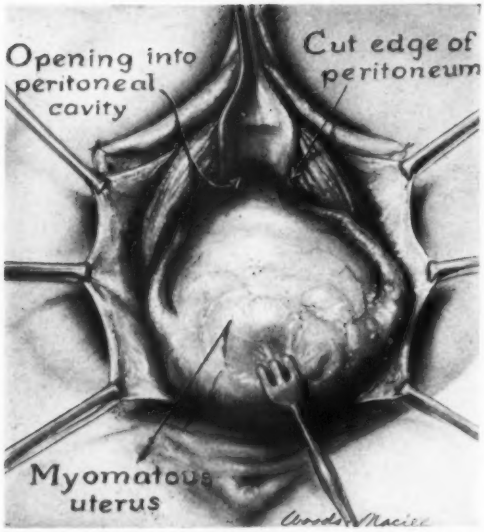


Fig. 4. Retractor is inserted beneath bladder, and peritoneum is incised transversely. Retractor is shifted into peritoneal cavity. Uterus and adnexa are explored manually. Uterine body is brought forward with cat's paw retractor.

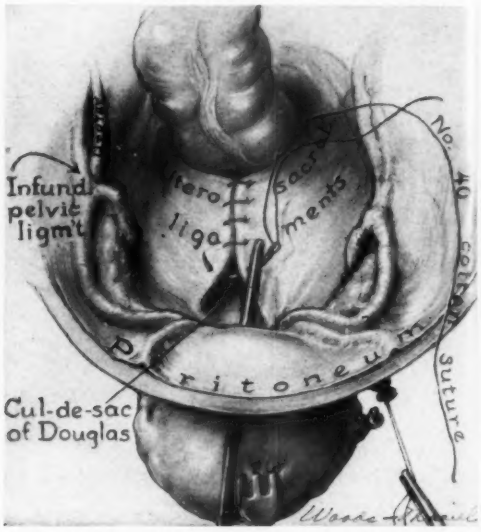


Fig. 5. Pararectal fossa (cul-de-sac of Douglas) is explored. When there is marked prolapse or extreme relaxation, with deepening of cul-de-sac, the uterosacral ligaments are coapted with interrupted sutures of No. 40 cotton. If ovaries are to be removed, infundibulopelvic ligaments are doubly ligated with chromic catgut and cut. If ovaries are to be retained, fallopian tubes, round ligaments, and utero-ovarian ligaments are doubly ligated as a group with No. 1 chromic catgut, and cut as close as possible to the cornua. Uterine vessels are ligated and cut at level of internal os.

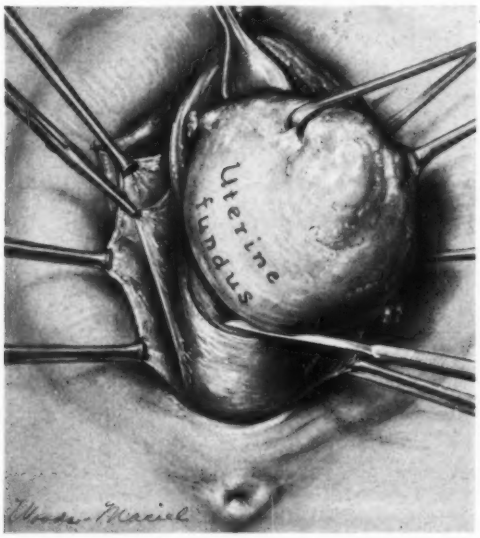


Fig. 6. Uterine body is amputated at point appropriate to individual case. Further conization of uterocervical segment may be done from above if desired.

are not traumatized. (6) The ureters are not endangered. (7) Herniations of bladder and bowel are replaced and supported adequately. (8) Extraperitonization of the uterocervical segment prevents bleeding into the peritoneal cavity, and makes the segment accessible if future care is needed. (9) Normal perineal tension is re-established. (10) Normal caliber and depth of the vagina are restored, as well as a normal introitus. (11) Finally, some function can be retained in young women by doing a fundectomy and leaving the endometrium intact.

The operation has the disadvantage that it ends childbearing, and so is better deferred until the family is complete. Yet it should not be postponed longer than necessary, because the disabilities increase with age. It may perhaps be contraindicated in very frail elderly women, though the present series has included patients from the ages of 22 to 71 years, without a death, and with very little

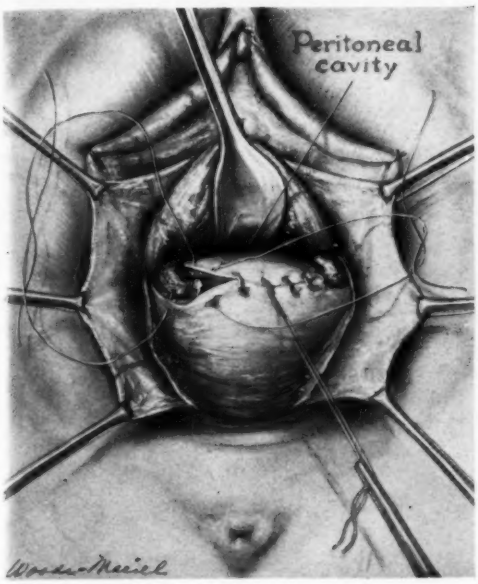


Fig. 7. Upper margins of uterocervical segment are brought together in center with a chromic catgut suture, which is tied but left long for traction. Round and utero-ovarian ligaments, tubes, and blood vessels are sutured into lateral angles of wound with interrupted No. 1 chromic catgut, and closure is completed with interrupted sutures. Traction is exerted to draw upper aspect of segment forward, and peritoneum is sutured to posterior wall with interrupted No. 000 catgut. This step closes peritoneal cavity and extraperitonizes uterocervical segment.

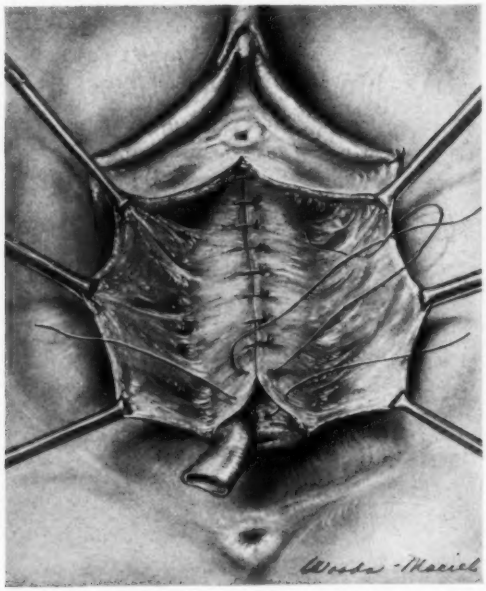


Fig. 8. Layer of fascia on bladder wall is imbricated with interrupted sutures of No. 40 cotton. Prevaginal fascia is then coapted snugly as a separate layer, with interrupted No. 40 cotton sutures, to within 1 centimeter of urethral meatus, forming a strong support to bladder and urethra. The final suture at lower angle approximates fascia to anterior wall of cervix. A Penrose drain is inserted into retrofascial space before complete closure.

morbidity referable to the operation. One patient was in the eighth decade of life, 14 were in the seventh, 27 in the sixth, 20 in the fifth, 16 in the fourth, and 6 in the third. Thirty-six of the women had not yet passed the menopause, while 46 were in or beyond this period. The records failed to classify the other two. In this series the time of operation averaged 1 hour 18 minutes, and varied between 58 minutes and 1 hour 46 minutes. The procedure is far less shocking than is an abdominal incision, and it has not been found that elderly patients need be denied the relief it affords because of the length of time on the table.

POSTOPERATIVE MANAGEMENT

In the postoperative care of these patients it has more and more become our practice to remove the indwelling catheter as early as possible, frequently on the first postoperative day. The patient is permitted to void, and then is catheterized for residual urine. If the residue is large or the patient is unable to void, an indwelling catheter is reinserted for a day or two, and again removed. After this the patient is catheterized every 8 hours until the residual urine is down to an ounce or less. In this way normal voiding is encouraged, and the progress of recovery can be gauged by the degree of retention. The patient is not permitted to leave the hospital until bladder function is practically normal. Four of our patients voided satisfactorily after the first postoperative day, but the average number of catheter days was 5½, with a maximum of 17 days in 1 case. In recent cases the average has been considerably reduced.

It has become increasingly evident that, as in repair of other types of hernia, early mo-

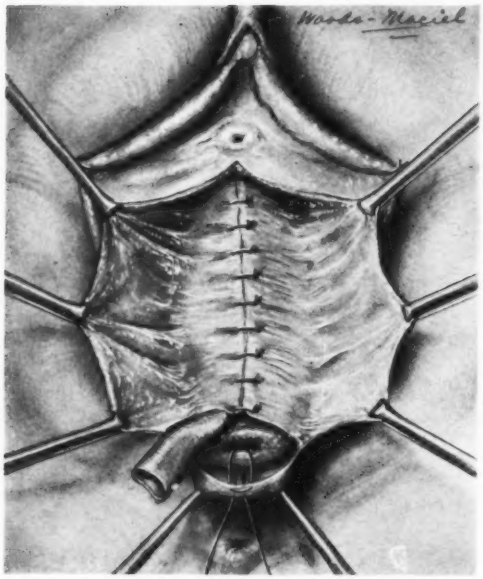


Fig. 9. Vaginal cuff is sutured to cervix. Either a Sturmdorf closure is used, as illustrated, or the first suture is placed in midline posteriorly, and succeeding sutures radiate from canal until stump is three quarters covered.

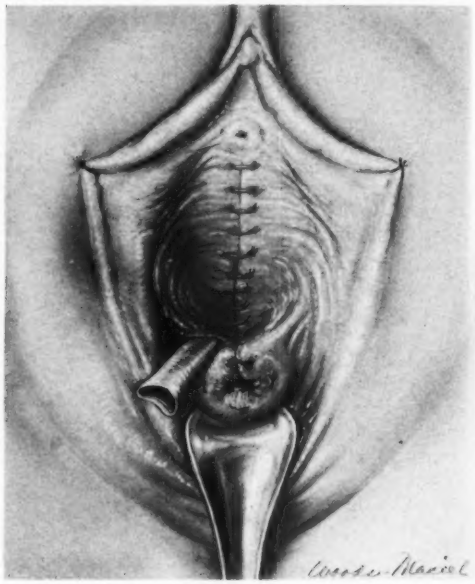


Fig. 10. Redundant tissue is trimmed from the two flaps of vaginal mucosa, and mucosa is closed with interrupted sutures of No. 000 chromic catgut.

TABLE I.—RETARDED RECOVERIES

Day out of bed	Day discharged	Age of patient	Reason for delay
12	22	67	Sustained temperature elevation.
11	49	38	Bronchopneumonia on 12th day. Thrombophlebitis of left leg 24th day. Secondary anemia, hemoglobin 40%.
12	13	29	Nervous, restless, depressed.
13	14	33	Large retention. Catheter till 9th day.
12	13	51	Large retention. Diabetes. Cholecystitis.
16	21	42	Cystitis. Anemia.
13	21	45	Heart disease. Thyroid adenoma. Diabetes.
17	21	36	Urinary and vaginal infection.
13	18	50	Vaginal infection.
8	19	41	Urinary infection, with abscess.
6	24	69	No one at home to care for her.
8	17	59	Urinary infection. Cholelithiasis. Senile.
5	17	52	Urinary infection. Poor general health. Hypertension. Goiter. Heart affection.
14	17	33	Urinary infection. High temperature. Anemia.
15	24	42	Stormy course. Pelvic infection. Cholecystitis.

bilization of the patient facilitates recovery. She starts, often on the first postoperative day, by sitting on the side of the bed and dangling her feet over the edge. Soon she is sitting up in a chair and going to the toilet to void. In the whole series of cases, because of a few retarded recoveries, the average days in bed numbered 8⅓, and hospital days averaged 13. In recent cases, however, the average has been reduced, and most of the patients now are out of bed on the second or third day after operation.

With the possible exception of the first patient, it does not appear that recovery was retarded appreciably by advanced age. The general health of the patient apparently had far more to do with delay in returning to normal.

In addition to the complications tabulated, there was 1 case of abscess of the cul-de-sac of Douglas. This patient was discharged, apparently in good condition, on the thirteenth day after operation. Three days later she was readmitted. The abscess was incised, and the patient again was discharged on the thirty-

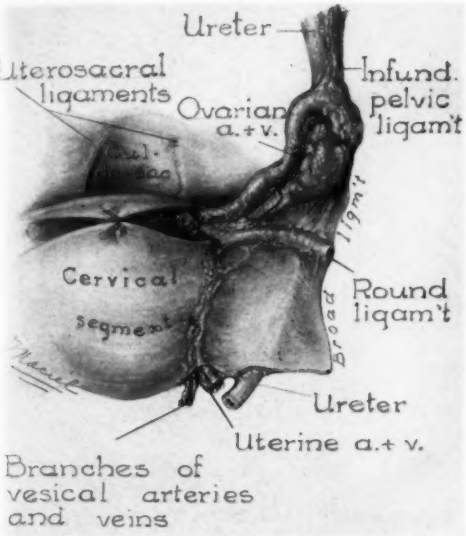


Fig. 11. The remaining uterocervical segment is the part to which are attached the basal portions of the broad and uterosacral ligaments. These ligaments have not been traumatized, the blood supply is ample, and the ureters are uninjured. Tubes and round ligaments are sutured into segment.

sixth postoperative day. Three years later she is in good condition, and shows no effect of the abscess.

There were a few mild urinary and vaginal infections, but these yielded readily to sulfadiazine. This drug is given almost routinely at the first sign of infection, and has greatly decreased the morbidity so common in pre-sulfonamide days.

RESULTS

Anatomical results are entirely satisfactory in 73 cases. One patient has a slight rectocele, and another a first degree cystocele with a redundance of the vaginal wall. One developed a recurrent cystocele after 5 months, and required a second operation, while in another case the perineal repair failed to hold, and had to be strengthened. Final anatomical results in both cases are satisfactory, though the first patient still has a very slight stress incontinence. Five patients have failed to report for re-examination. Of two who complained of difficult or painful intercourse, one

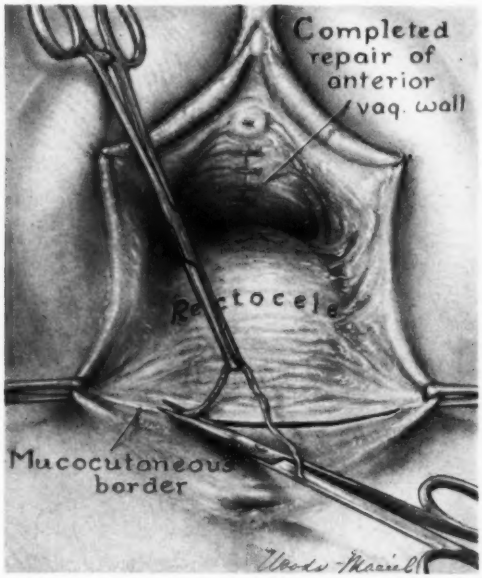


Fig. 12. Triangular area of posterior vaginal wall to be lifted is defined by exerting traction upon three Allis clamps placed one in midline posteriorly at mucocutaneous border, and one at each side of vaginal introitus opposite lower border of hymen. Transverse incision is made by cutting out a narrow strip along mucocutaneous junction with scissors.

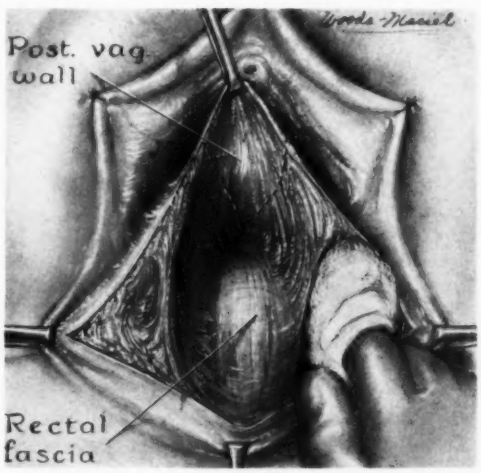


Fig. 13. Inverted V-shaped flap of vaginal wall is dissected upward from margin to well above apex of rectocele. Redundant area of vaginal wall is removed by excision of an inverted V-shaped section (indicated by dotted lines).

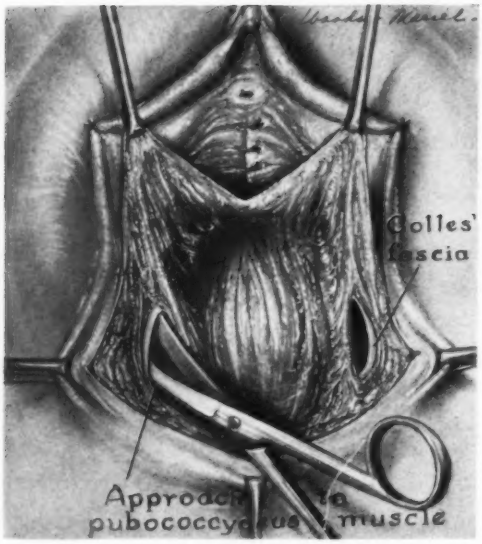


Fig. 14. By inserting curved Mayo scissors laterally and obliquely, an incision is made on each side through superficial fascia and urogenital diaphragm up to level of pubococcygeus muscle. Scissors are withdrawn with blades widely opened.

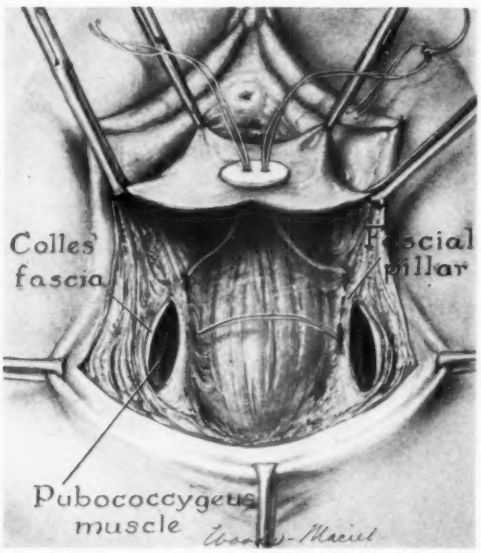


Fig. 15. Double suture of chromic No. 1 catgut is threaded through a button and passed downward through vaginal wall at a point above apex of rectocele, then passed through each lateral pillar of fascia, and returned through vaginal wall and button.

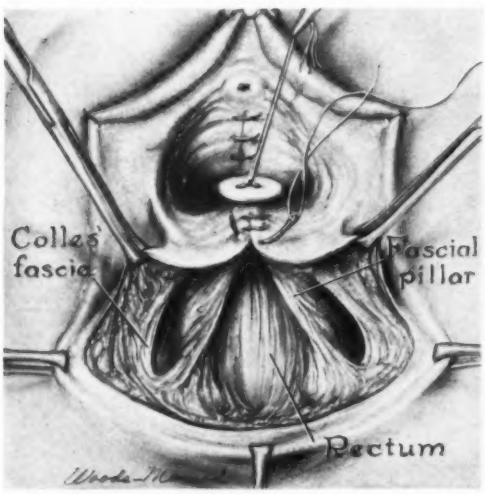


Fig. 16. Closure of vaginal wall is started by placing two or three interrupted chromic No. 000 sutures. Double chromic suture is then tied over button. Fascia is thereby coapted snugly over anterior rectal wall, rectum is elevated above weakened portion of vaginal wall, and high fascial support is provided which eliminates rectocele.

has some shortening of the vagina, but in the other the vagina is of almost normal depth and caliber.

Complete freedom from symptoms has been achieved in 62 cases. No information has been obtained in 5 cases. Of 17 patients who complained of various symptoms, all but 4 have good anatomical results from this operation. Symptoms reported often were due to causes unrelated to the surgery. In 1 case a trichomonas infection was responsible for burning and pain in the bladder. In a second case, pain on urination which developed 3 years after operation was caused by urethral caruncle. A third patient, who, although improved, continued to have stress incontinence, nocturia, and coccygeal pain, was found to have a kinked ureter, and required nephropexy. A fourth, whose chief complaint was backache, has been relieved by nephropexy. One patient who has complained of urinary frequency, burning, and pain is now under treatment for urethral caruncle. Another, who failed to return for postoperative care,

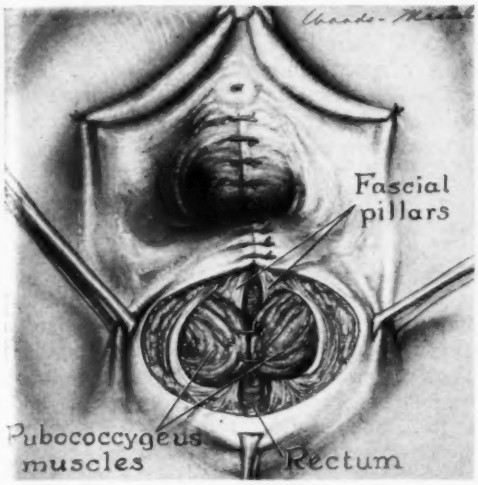


Fig. 17. Medial fibers of pubococcygeus muscles are grasped with forceps, drawn through lateral incisions toward midline, and sutured together with chromic No. 1 catgut.

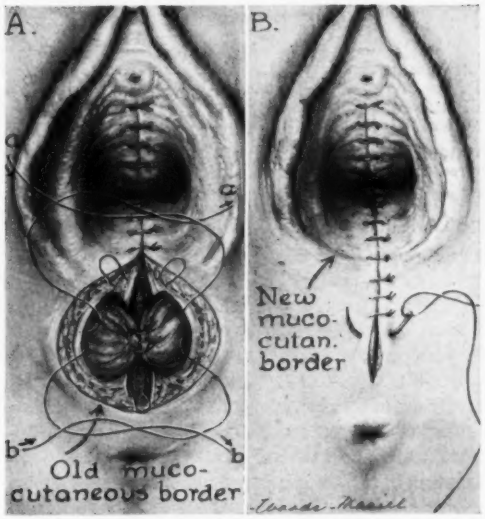


Fig. 18. A, Fused muscles and fascial structures which compose perineal body are coapted with two deeply placed crown sutures of chromic No. 0 catgut, upper suture passing beneath fascial pillars. This procedure results in a convex perineum and firm fascial support over rectocele which will not be torn out by early mobilization of patient, purgation, or impaction. Closure of vaginal wall is then completed. B, Skin margins of old transverse mucocutaneous border are approximated in midline with interrupted No. 000 chromic catgut to make a longitudinal closure. Two pieces of acriflavine gauze are inserted into vagina to give firm support to anterior colporrhaphy area, so that hematoma may be avoided. Foley catheter is inserted into urethra.

NOTE. In the presence of enterocele, posterior dissection is completed before closure of peritoneum (Fig. 7). Separation of rectum from posterior vaginal wall is continued up to uterosacral ligaments, guided by a finger inserted over uterocervical segment into cul-de-sac. Peritoneum of cul-de-sac is dissected out like a hernia sac and opened, purse-string sutures are inserted about neck, and sac is amputated. Closure is fortified by additional interrupted cotton No. 40 sutures. Uterosacral ligaments are approximated. Anterior incision is closed (Figs. 7 to 10), and perineal repair is then completed.

has a cervical stenosis, with an offensive discharge, and may require excision of endometrium. Four with excellent anatomical results complain of frequency, nocturia, or backache of undiscovered origin, and one has a vaginal pruritus the cause of which is undetermined. Four patients have a residual stress incontinence that can be explained only on the basis of damage to the urethral sphincter. A large and heavy cystocele stretches the sphincter. When it has been present for a long time the muscle tone may be lost permanently.

Incontinence of varying degrees was present before operation in 25 cases. Of these, 20 have been completely relieved, 3 are improved, 1 is unimproved, and 1 patient has not returned.

Of 19 relatively young premenopausal women in whom fundectomy was done, 17 are menstruating, one of them only after a lapse of 2 years, and 2 have not menstruated. Hot flushes have been reported by 5, though only 1 of these has failed to menstruate. One who has not menstruated has no menopausal symptoms.

Supracervical hysterectomy was done in 8 relatively young premenopausal women, and in 5 the endometrium was completely destroyed by conization. Only one of this group, a woman aged 42, who was not conized, reports menopausal symptoms. This patient, it must be noted, had a bilateral salpingectomy and right oophorectomy 18 years ago. She had been menstruating before the composite operation, though her periods were becoming irregular. It may be, therefore, that the surgical procedure only hastened slightly an approaching menopause.

Opinions differ as to the value of leaving endometrial tissue intact. In the writer's ex-

TABLE II.—RESULTS

	Cases	Per cent
Anatomically satisfactory	73	87
Reoperation	2	2
Minor defects	4	5
Not examined	5	6
Symptom-free	62	74
Symptoms due to—Unrelated conditions	7	8
Undetermined causes	8	10
Anatomical defects	2	2
No information	5	6
Incontinence—Relieved	20	80
Improved	3	12
Not improved	1	4
No information	1	4

perience, the ovaries often have ceased to function not long after a panhysterectomy, and menopausal symptoms have supervened. Other operators have reported the same phenomenon, and some have postulated the existence of an endometrial hormone which reacts with the ovaries. This is now believed to be erroneous, since a considerable proportion of the patients are free of menopausal symptoms until the normal age for the climacteric. Our series is too small to be definitive, though in individual cases the presence of endometrium has not prevented menopausal symptoms and in others its absence has not precipitated them. It is generally conceded, however, that preservation of some menstrual function has a good psychological effect, and is desirable in young women.

SUMMARY

Eighty-four composite operations for relief of uterine prolapse and associated herniations were performed between April 13, 1942, and July 12, 1945. The patients were all white women, aged 22 to 71 years, in moderate to comfortable economic circumstances.

Prolapse was found in 81 cases, cystourethrocele in 84, rectocele in 80, and enterocele in 1. Other findings included cervical and perineal lacerations, tumors, infections, and urinary incontinence.

The sound anatomical basis of the operation is discussed, and the technique described and illustrated in detail. Postoperative management is outlined, with emphasis on early removal of indwelling catheter and early mobilization of the patient.

The operation has many advantages. Though it appears highly technical, it is reasonably easy to perform. Diseased tissue is eliminated, but a segment of cervix is retained to which the supporting ligaments are attached. These ligaments and the ureters are not traumatized, and the blood supply is adequate. Menstrual function may be preserved in young women by doing a fundectomy and leaving the remaining endometrium intact. The operation is less shocking than is an abdominal incision, and may safely be used in elderly patients despite its average time of 1 hour 18 minutes. The writer is of the opinion that this operation is superior to any other previously proposed for treatment of the prolapse syndrome, especially in first and second degree cases.

REFERENCES

1. Curtis, A. H., Anson, B. J., and McVay, C. B. Surg. Gyn. Obst., 1939, 68: 161.
2. Curtis, A. H., Anson, B. J., and Beaton, L. E. Surg. Gyn. Obst., 1940, 70: 643-656.
3. Curtis, A. H., Anson, B. J., and Ashley, F. L. Surg. Gyn. Obst., 1942, 74: 709-727.
4. Richardson, Edward H. Am. J. Obst., 1937, 34: 814.
5. Spalding, Alfred Baker. Surg. Gyn. Obst., 1919, 29: 529.
6. Sturmdorf, Arnold. Gynoplastic Technology. 2d ed. Philadelphia: F. A. Davis Co., 1923.
7. TeLinde, Richard W. J. Am. M. Ass., 1945, 127: 495.
8. Ward, George Gray. Surg. Gyn. Obst., 1929, 48: 399-403.

COMBINED ABDOMINOTHORACIC APPROACH FOR CARCINOMA OF CARDIA AND LOWER ESOPHAGUS

JOHN H. GARLOCK, M.D., F.A.C.S., New York, New York

DURING the past 50 years, surgeons have attempted, on numerous occasions, to evolve an approach for the radical extirpation of cancer of the cardiac end of the stomach and lower esophagus which would combine the features of safety and wide exposure. In the early days, because of the fear of entering the pleural space, all sorts of complicated osteochondral flaps were fashioned which would at the same time permit of adequate exposure and minimize the possibility of opening the pleura. Thus, Lannelongue was one of the first to expose the upper abdominal contents by incising the 8th to the 11th cartilages or ribs. Somewhat later, Micheli devised a thoracoabdominal flap, preserving the pleura, but was never able to carry it out on a living person. Von Mikulicz, however, did resect a cancer of the cardia by means of an incision similar to Micheli's. With another patient, he handled the approach in a different manner: a median abdominal incision from umbilicus to ensiform cartilage; a second incision at right angles to the first, starting from the upper end and extending outward to the left axillary line. This incision was deepened down to the 7th, 8th, and 9th ribs which were denuded at the costochondral junctions. The cartilages were then divided and the ribs retracted to the left to visualize the cardia. Both patients died shortly after operation.

Somewhat later, Marwedel, after 2½ years work on cadavers, reported a different method which was used on a living patient "with success." The essential features were these: (1) a curved incision on the left side, 2 finger breadths from the costal margin and parallel to it, extending from the ensiform cartilage to the 10th rib; (2) retraction of the skin and division of the 3d to the 7th rib cartilages; (3) separation of the rectus abdominis and external oblique muscle from the 7th, 8th, and 9th ribs; (4) division of the costochondral junctions of the 9th, 8th, and 7th ribs; (5) the upper skin flap is replaced and the chondral cage is retracted upward and flapped away from the incision to expose the left upper

From the Surgical Service of the Mount Sinai Hospital, New York.

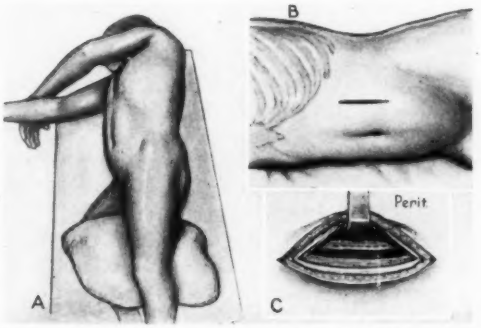


Fig. 1. Patient lies on operating table so that his back is inclined toward table about 5 degrees beyond lateral position. The abdominal portion of the incision is situated at the outer border of the left rectus muscle.

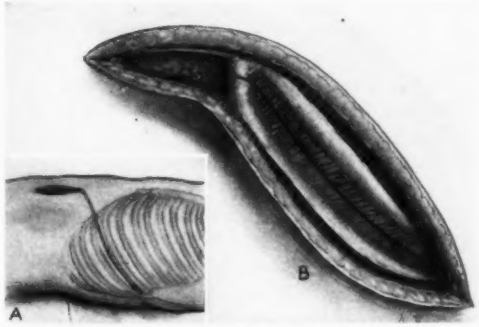


Fig. 2. Continuation of the abdominal incision toward the costal arch and extending in the 8th interspace as far as the vertebral border of the scapula. Costal arch is divided along the line of the incision between the 8th and 9th ribs.

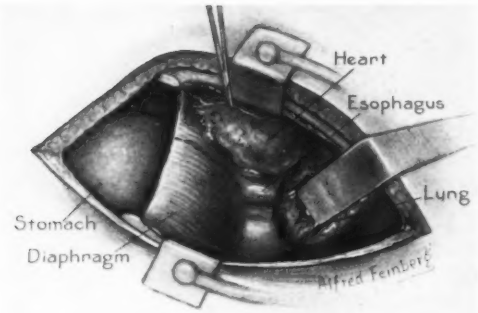


Fig. 3. The chest cavity has been entered through the 8th interspace and the line of incision in the diaphragm is indicated by the dotted line. It extends from the peripheral attachment to the esophageal hiatus. The left phrenic nerve is being crushed.

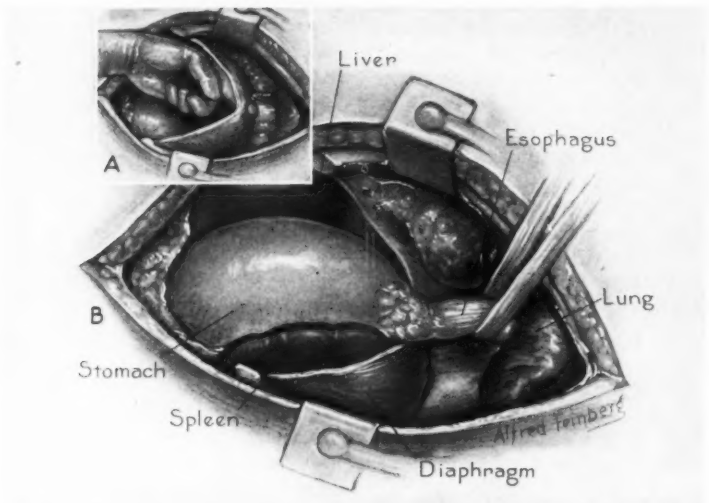


Fig. 4. The diaphragm has been divided. Insert A shows the method of division near the hiatus. The cardia is separated from its diaphragmatic attachment. A clear view is obtained of all the upper abdominal contents as well as those in the thoracic cavity.

quadrant structures. This complicated maneuver of Marwedel's was designed with the twofold purpose of providing a clear view of the left upper quadrant and preventing entry into the pleural cavity.

Since Marwedel's publication, many modifications of his method have been reported, notably by Hedblom, Meyer, Ohsawa and others. As the physiological aspects of an open thoracotomy gradually became more clearly understood and means were developed to combat the cardiovascular and respiratory difficulties produced thereby, surgeons lost their fear of the chest and began to tackle the problem by more direct methods. The story of the development of surgery of the esophagus and cardia since then is replete with examples of the vision, originality, and ingenuity of American surgeons.

The incision and exposure to be described is not to be construed as an original method. It is, rather, a natural development after more than 10 years of intensive work and study of this field of surgery and combines the best features of all previously reported methods. Humphreys first called my attention to the

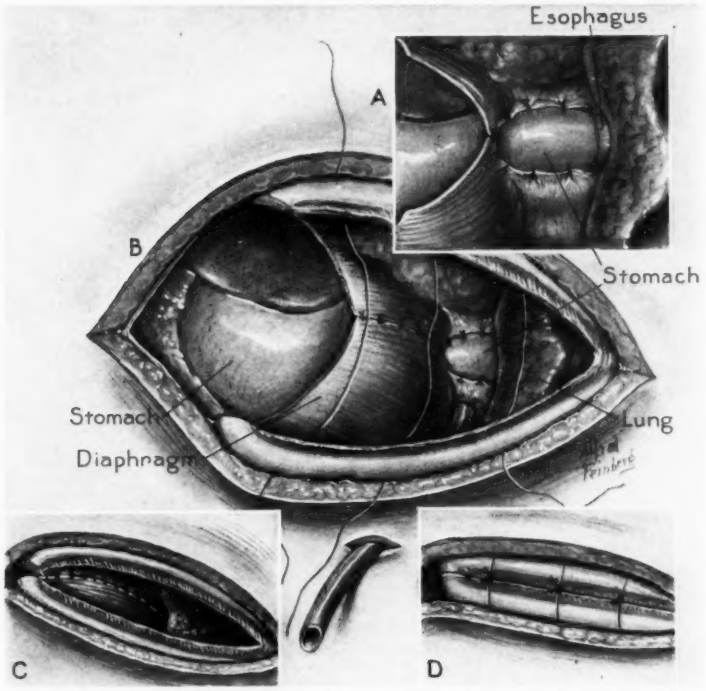


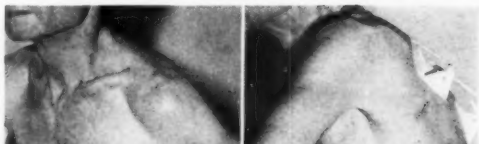
Fig. 5. Details of the repair of the incision: A, suture of the transplanted stomach to the mediastinal pleura and the enlarged opening in the diaphragm to prevent herniation of the abdominal contents; B, repair of the transected diaphragm by the use of the interrupted silk sutures; C, the completed diaphragmatic repair; D, closure of the chest cavity by the use of sutures encircling the contiguous 8th and 9th ribs. The underwater drainage tube in a subjacent interspace is indicated.

simplicity of the combined abdominothoracic approach when he presented before the New York Surgical Society about 2 years ago a patient who had been operated upon for a carcinoma of the cardia.

As I have repeatedly emphasized in previous publications, it is important, when dealing with cancer of the cardia to determine operability before making extensive chest incisions which, in the case of inoperable growths, would be uncalled for and unnecessary. I have, therefore, repeatedly stated that operability should be determined by the use of a small upper left rectus incision. Intra-abdominal palpation quickly reveals the presence or absence of hepatic metastases, fixation of the growth to vital structures, metastatic nodules over the diaphragm, peritoneum or pelvis and extensive retroperitoneal lymph node involvement. The direction of lymph node spread with squamous cell cancers of the lower third of the esophagus may be almost entirely below the diaphragm. Therefore, preliminary abdominal exploration with this type of tumor may be as important as with adenocarcinoma of the cardia. Heretofore, if an operable tumor was demonstrated, the abdominal incision was closed, the patient was turned on his side and the left chest opened through an appropriate incision for a transthoracic resection of the upper stomach and lower esophagus. The combined abdominothoracic incision is a natural sequence of the plan of procedure above described.

This incision is not applicable for tumors involving the middle third of the esophagus.

Fig. 6. Continued repair of the incision: A, indicates the iejunostomy tube inserted after the method of Witzel; B, shows the completed repair of the incision.



Figs. 7 and 8. Photographs of patient operated upon for carcinoma of the cardia with the use of the incision reported in the text.

Exposure for this particular site can be obtained by the transthoracic approach described in the paper published in 1944 reporting for the first time the operation of supra-aortic esophagogastric anastomosis for cancer of the middle third of the esophagus. This operation was devised to eliminate the undesirable features of the Torek operation. Since then, other surgeons throughout the country have carried out the procedure with a low operative mortality and restoration of the normal swallowing mechanism. I believe that the procedure can now be considered beyond the stage of experiment.

TECHNIQUE OF THE INCISION

The patient is placed on his right side in such a way as to incline his back toward the operating table about 5 degrees beyond the exact lateral position. The knees are crossed and the pelvis is strapped to the table to steady the patient. The left arm is extended toward the right side of the operating table so as to swing the left scapula forward. After appropriate skin preparation and draping, the left costal cartilage arch between the 8th and 9th ribs is marked on the skin by a scratch mark. A 5 inch incision is now made along the outer edge of the rectus muscle, placed so that its upper end is slightly below the scratch mark on the costal arch. On entering the peritoneal cavity, the surgeon should look for pelvic metastases, nodules in the liver, extensive retroperitoneal peripancreatic lymph node involvement, metastases to the diaphragm and fixation of the growth itself to vital structures, such as the aorta. Manual exploration of the entire abdomen should be done thoroughly but gently.

If an operable tumor is demonstrated, the incision should now be extended by continuing the upper end of the rectus incision toward the scratch mark on the costal arch. From here, the incision is swung upward and outward in the interspace between the 8th and 9th ribs as far as the vertebral border of the scapula. All structures are divided as the incision is deepened. The cartilaginous costal arch between the 8th and 9th ribs is then cut across, thus permitting access to the pleural cavity. With a finger beneath the parietal pleura guiding the surgeon, the intercostal muscles and pleura are divided as far as the posterior end of the skin incision. A rib spreader inserted between the ribs now affords the surgeon a clear view of the left leaf of the diaphragm. This is cut across in a radial direction from the peripheral rib attachment to the esophageal hiatus. The main phrenic artery and its branches can be ligated and divided under direct vision.

The wound is now made larger by opening the rib spreader as widely as is necessary. The excellent exposure thus obtained accomplishes many purposes: (1) all manipulations can be

carried out under direct vision with greater ease; (2) it is possible to ligate the main gastric artery at its exact origin from the celiac axis, thus insuring complete lymph node excision; (3) it enables the surgeon to resect the tail of the pancreas and the spleen if this becomes necessary; (6) it shortens considerably the operative time, which is a desirable feature; (5) should a total gastrectomy become necessary, the visualization of the jejunal blood supply and the performance of the esophagojejunal anastomosis are made more easily.

After the necessary anastomosis has been effected, the incision is closed layer by layer. The diaphragm is repaired with interrupted silk sutures and the enlarged opening is sewn to the transplanted stomach. Before the chest wound is closed, a rubber tube is inserted in the 9th interspace for underwater drainage. The costal arch is repaired by approximating the cartilages with chromic catgut. Before the abdominal incision is closed, a Witzel jejunostomy is done for feeding purposes. A properly applied snug dressing completes the operation.

The relative comfort of these patients as compared with those who have had rib cutting and rib excision operations is very impressive. It seems to me that the postoperative course is smoother and more rapid. We have, up to the present writing, employed this incision on fourteen occasions and have become more impressed with each succeeding case. I believe that its more general adoption will simplify considerably the problem of carcinoma of the cardia and lower esophagus.

REFERENCES

1. GARLOCK, J. H. Surg. Gyn. Obst., 1938, 66: 534-548.
2. Idem. N. Internat. Clin., 1939, 1: 28-45.
3. Idem. Surg. Gyn. Obst., 1940, 70: 556-569.
4. Idem. Arch. Surg., 1940, 41: 1184-1214.
5. Idem. Surgical Treatment of Diseases of the Esophagus. In Bancroft's Operative Surgery. New York: D. Appleton-Century Co., 1941.
6. Idem. J. Mount Sinai Hosp., N. York, 1941, 7: 349-352.
7. Idem. Surg. Gyn. Obst., 1941, 73: 244-256.
8. Idem. Am. J. Surg., 1941, 54: 262.
9. HEDBLOM, C. A. Surg. Gyn. Obst., 1922, 35: 284-287.
10. HUMPHREYS. Personal communication.
11. LANNELONGUE. Quoted by Marwedel.
12. MARWEDEL, G. Zbl. Chir. 1903, 30: 938-941.
13. MICHELI. Italienscher Chirurgen Kongretz, 1895.
14. MIKULICZ. Mitt. Grenzgeb. Med. Chir., vol. 8.

THE PROBLEM OF STRESS INCONTINENCE AND ITS SURGICAL RELIEF

W. E. STUDDIFORD, M.D., F.A.C.S., New York, New York

THE past fifty years has witnessed a very full development of specialization in medicine. Among the fields which have tended to become separated in the process are those of urology and gynecology, so that many present day gynecologists have little or no experience in urological problems; the average urologist is in no better position in regard to gynecology. This situation is unfortunate since the bulk of urologic disorders peculiar to the female are fundamentally due to gynecological factors. Occupying a prominent place among such urological conditions is the symptom of stress incontinence due to urethrocele. The fact that this condition lies at the border line between two specialties may account for the common lack of understanding of its nature and to the slow progress of its surgical relief.

Stress incontinence in the female, under conditions which raise intra-abdominal pressure, such as sneezing, coughing, lifting heavy weights, or, in extreme cases, any exertion, is a common gynecological symptom. In most instances it is of occasional occurrence and can be considered only a minor annoyance. Under these conditions most patients conceal this symptom and admit to it only under direct questioning (20). In a minority the symptoms develop to such a degree that the patient, on the slightest exertion, discharges a large amount of urine. Such patients are continent only when lying down or sitting quietly; their disability, therefore, becomes a subject of major complaint. It is with this extreme degree of incontinence that this report is chiefly concerned, particularly if previous efforts at surgical cure have resulted in failure.

Reference to gynecological texts of the late nineteenth century reveal that this condition, then termed passive incontinence, was regarded as most difficult of relief (13). Prominent in the treatment was a varied and wholly irrational group of drugs, as well as different types of physiotherapy. Surgery was mentioned as a possible treatment with the very faint recommendation that it was usually unsuccessful. Dudley (4), in his presidential address entitled "Incontinence in Women" before the American Gynecological Society in 1905, summarizes the therapeutic knowledge of a somewhat later period. He mentions four main types of treatment: (1) injection of paraffin in the region of the urethra; (2) massage and electricity; (3) torsion of the urethra (180°–450°) as advocated by Gersuny; and (4) advancement of the external urethral orifice, advocated by Pawlik, Hemmelfarb, Alberran, and others. He condemned the first three forms of treatment as being useless or dangerous, but saw some merit in the last, describing an advancement operation which he himself had devised. It is of interest in this regard that Berkow recommended advancement of the external urethral orifice as recently as 1941, reporting 17 cures in 21 cases, although it is difficult to see how such a procedure would restore an incompetent internal sphincter (2). In addition Murless reported successful results following the injection of sclerosing solutions about the urethra in 1938 (15); therefore, these old forms of treatment have not been completely abandoned. It is probable that the procedure advocated by Kelly in 1913 (4, 8) and utilized by him during the preceding 10 to 12 years, was the first operation directed at the cure of stress incontinence and practiced extensively in this country. The successful results of this technique, commonly known as the Kelly stitch and still widely used, were at first attributed to the tightening of a relaxed internal sphincter. Following the introduction of this operation, various modifications were developed, involving more extensive dissection and often plication of the dilated bladder neck and upper

From the Department of Obstetrics and Gynecology, Columbia University, and The Sloane Hospital for Women.

urethra as well as the supporting fascia (3, 7, 20). The most recent of these operations, devised by Kennedy, includes a mobilization of the upper urethra by separation of the lateral fascial attachments from the pubis (10, 11, 12). During this period it was realized that the most important aim to be attained by surgery was the reapproximation of the fascial supports of the bladder neck so that this structure was held securely behind the symphysis (3, 20). When such a result was accomplished the previously atonic sphincter regained its tone and once more became competent. Unless support was attained the bladder neck and upper urethra would once more prolapse to form a urethrocele, and the incontinence would recur because of the consequent loss of sphincter tone.

While successful results are attained, in a majority of instances, by utilizing the residual tissues—particularly if the incontinence is of slight degree—all operators report failures. These range from 20 per cent, as reported by Kelly (9), to the recent figure of 7.1 per cent reported by Kennedy (12). While no accurate figures can be reported, it is believed that the percentage of failures in our own clinic fall somewhere between these figures. Once a failure has occurred further operations of the same type are apt to be unsuccessful. This tendency may be illustrated by one of the cases about to be reported:

No. 8523-43 Mrs. J. V., aged 38 years, tripara, quadrigravida, was admitted to the gynecological service, Bellevue Hospital, on February 20, 1943, for the fifth time, with a chief complaint of stress incontinence. In her first pregnancy in 1924 she was delivered by forceps at home after a labor of 5 days. Her symptoms date from this event. Full term pregnancies occurred in 1927 and 1933, and a 3 month spontaneous abortion in 1935. She first sought surgical relief for her incontinence in 1930. At this time a diagnosis of cystocele, relaxed vesicle sphincter and relaxed perineum was made. The cystocele was repaired, the Kelly technique was employed to tighten the vesicle sphincter, and a perineorrhaphy was performed. No improvement in the incontinence occurred although her pelvic supports were adequately restored. In 1933 a second attempt to control the symptom was made, utilizing the same procedure except that perineorrhaphy was found to be unnecessary. Again complete failure was the result. In 1940 a third attempt was made utilizing the technique described by Kennedy. Again, failure was the result. Six months later, in the same year, a fourth attempt was made to help her by the implantation of a strip of fascia lata under the bladder neck. No noticeable improvement followed.

Results such as this frequently cause the gynecologist to assume the attitude that nothing further can be done to relieve the patient.

Today the problem of urethrocele with stress incontinence lies in the surgical relief of patients who have experienced operative failures and in the avoidance of such failures. If the facts underlying this condition are correct there are three possible explanations for these failures: first, that the operative procedure has been inadequate; second, that the healing process has been imperfect due to infection or faulty blood supply; and third, that the supporting tissues have once more given way under the continued assault of intra-abdominal pressure. The first explanation often can be discarded since failures occur in the hands of experienced operators using procedures which appear fundamentally correct. Of the second and third explanations the last appears the most likely since serious infection is rarely seen in operations on the anterior vaginal wall, and in most failures temporary relief is obtained only to be followed by a recurrence of the condition.

Since the last supposition appears to be the explanation of most failures the reinforcement of the residual fascia by transplanted tissue would seem to be a possible answer to the problem. Such an attempt has been made by several gynecologists, utilizing muscle and fascia from several sources. The best known of these operations is that termed the Goebell-Frangenheim-Stoeckel procedure, in which, following a plastic repair of the bladder neck, strips of rectus fascia and underlying muscle are transplanted behind it (5, 6, 16). This operation never has been performed widely in this country. Others have reinforced the lower urethra with transplanted tissue (14, 19), although such a procedure would not be expected to have favorable results. Interest in the value of fascial reinforcement was stimulated by the report of Aldridge in 1942 on the use of transplanted strips obtained from the aponeurosis of the oblique muscles in combination with a plastic operation on the upper

urethra and bladder neck (1). He had obtained complete relief in a patient with stress incontinence who had been operated upon twice previously without success. Since then he has obtained favorable results in several similar cases.

Impressed by the result reported by Aldridge, a study of the application of this principle was undertaken. Since 1943 transplanted abdominal fascia has been utilized in a group of 44 patients to reinforce the repaired supports of the bladder neck and upper urethra. Thirteen of these cases have already been reported (17, 18). The present report includes this group and an additional 31 cases since operated upon. The etiological factors may be summarized as follows: There were 2 cases of congenital origin, 1 not influenced by full term delivery but suffering from congenital lues, and the other made worse by full term delivery. There were 25 cases of traumatic origin. Of these 16 cases were immediate, within 2 years of delivery and 9 were remote, more than 2 years after delivery but under the age of 40 years. There were 16 cases of traumatic and involutional origin—10 cases at time of menopause and 6 cases remote from menopause. Only 1 case was of purely involutional origin, a nullipara aged 70 years. That urethrocele may be of congenital origin is not commonly realized. The available labor records were reviewed, and it was found that a surprising number of the preceding deliveries had taken place without obvious injury. Often great care had been expended to preserve the perineum. This fact suggests that the forward projection of the presenting part in the second stage by the intact perineum often may be the traumatic agent. If this is true, the performance of an adequate episiotomy should obviate the occurrence of such an injury.

The most frequent lesion found on examination was the uncomplicated urethrocele which was present in 25 patients. This finding was mainly due to the large proportion of patients in this group who had undergone previous plastic operations (13 cases) with otherwise satisfactory results. Particular attention should be called to the group of patients who, in addition to urinary incontinence, showed indications for pelvic surgery. In 9 cases the urethrocele was complicated by additional forms of relaxation, in 1 case 2 previous operations had failed to relieve the incontinence and in 8 cases there had been no previous surgery. In 10 other cases the urethrocele was complicated by additional forms of relaxation and by indications for hysterectomy. In 2 of these, 3 previous operations had failed to relieve the incontinence and in 8 cases no previous surgery had been performed.

Some may quarrel with the use of this procedure in so many primary cases. It can only be stated that in each instance there appeared to be a factor that made the possibility of failure by other methods seem likely. Among such factors were the age, the extent of the relaxation, and the character of the residual pubocervical fascia. For example, in this group was a nullipara, aged 69 years, with marked stress incontinence of 1 year's duration and a well developed urethrocele; also a 31 year old woman with a large urethrocele, apparently of congenital origin, who had suffered from incapacitating stress incontinence during her entire life. In the group requiring abdominal surgery, it was a matter of few moments to add the fascial reinforcement to the plastic operation previously performed.

In 15 of these patients the procedure described by Aldridge was used in a slightly modified form. Follow-up has revealed successful results in 11, but failures have resulted after a brief interval in 4 cases, accompanied, in each instance, by a recurrence of the urethrocele. Nevertheless the relief of most of these patients, most of whom had experienced one or more previous operative failures, was convincing evidence that the underlying principle was correct.

Experience with the Aldridge technique has shown several disadvantages. It involves (a) two changes in position; (b) the simultaneous performance of abdominal and vaginal operators, and because of these complexities (c) an increased opportunity for lapses in surgical asepsis. Most important, there appeared to be no way to fit accurately the fascial strip to the bladder neck. Frequently, because of shortness the strips had to be brought together under marked tension. In spite of the latter defect, union took place in

some patients quite unexpectedly. In others separation of the strips is suspected as the cause of the subsequent failure. The final disadvantage lay in the fact that the procedure was awkward to utilize if indications for reinforcement of the residual fascia was discovered unexpectedly at the time of a plastic operation on the bladder neck.

Because of these defects this type of operation was abandoned and another technique was adopted. This has been used on 30 patients, including 1 in whom a failure had resulted from the modified Aldridge procedure. It may be described as follows.

TECHNIQUE

The patient is put in the lithotomy position, prepared, and draped. The labia minora are retracted laterally by means of stay sutures. A weighted speculum is placed in the vagina thus exposing the lower anterior vaginal wall. In many of these patients previous operative procedures have resulted in adequate support to the portion of the bladder adjacent to the upper vagina and cervix. As a result of the previous perineorrhaphy the cervix may be difficult to draw down or expose. Since the necessary dissection is about the upper urethra and bladder neck, such exposure is not necessary. The anterior vaginal wall is seized with two Allis clamps, placed as far lateral from the midline as possible and at as high a level as can be attained. A third Allis clamp is placed in the midline about 1 centimeter from the urethral orifice. The scars of one or more previous operations can often be seen on the anterior vaginal wall (Fig. 1). The vagina is held tense by lateral traction on the first pair of clamps and a transverse incision is made between them through the depth of the wall. Scissor dissection at the lateral portion of this incision defines the plane between the bladder and the lower anterior vaginal wall, following which the scar in the midline can be divided without any risk of injury to the bladder neck or urethra. The lower anterior vaginal wall is then divided in the midline at right angles to the first incision. The edge of the vaginal wall on each side is seized by Allis clamps. Traction downward on these clamps and traction upward on the clamp placed near the urethral orifice aids greatly in freeing the vaginal wall from the urethra and in making this incision. It should be carried to a point about 1 centimeter from the urethral orifice. The upper anterior vaginal wall can then be freed for a distance of 1 to 2 centimeters from the bladder and incised in the midline, Allis clamps being placed on the edge of the freed wall. The combined incisions result in the exposure of a diamond shaped area under which lie the upper urethra and bladder neck. The plane of the supporting fascia of the upper urethra and bladder neck is then identified, a varying amount of sharp dissection being necessary (Fig. 2).

Once found, the plane of separation along the outer aspect of this fascia can usually be followed by blunt dissection with the finger outward and upward to its line of attachment along the inner aspect of the superior pubic ramus (Fig. 3). Moderate pressure at this point with the finger results in rupture of the attachment allowing the finger to enter the space of Retzius. Occasionally penetration of the lateral part of the fascia must be accomplished by scissors. This dissection is carried out on each side. The bladder neck and upper urethra are thus fully mobilized. Considerable bleeding may accompany the latter stages of the dissection due to rupture of veins about the bladder neck. Since the source of bleeding is inaccessible it is fortunate that it invariably ceases spontaneously after a short interval. The supporting fascia of the upper vagina and bladder neck is then plicated by means of interrupted mattress sutures. The number of sutures required varies from one to three. This results in an elevation of the bladder neck behind the symphysis and a consequent lengthening of the urethra. A Penrose drain, measuring at least 30 centimeters in length, is then placed with uterine forceps so that an end lies in the space of Retzius on each side of the bladder, the midpoint of the thin tubing lying just underneath the bladder neck (Fig. 4). The excess vaginal mucosa is then excised in the form of four triangles, the tissue traumatized during the operation being removed. The vaginal wall is then closed with interrupted sutures from below upward, taking great care not to in-

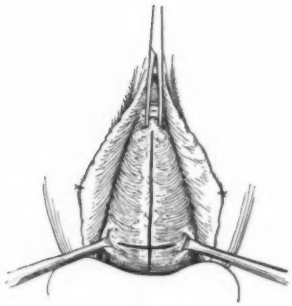


Fig. 1

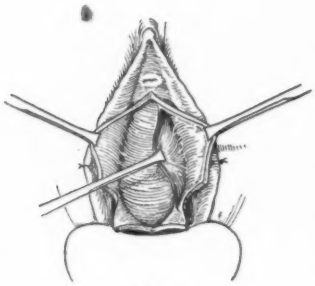


Fig. 2

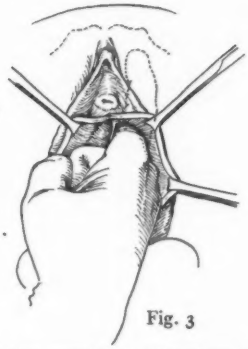


Fig. 3

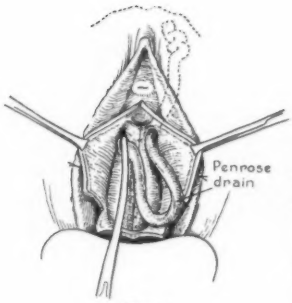


Fig. 4

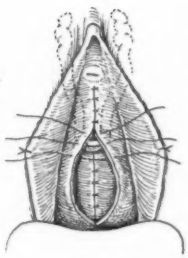


Fig. 5

Fig. 1. Vaginal wall held tense by Allis clamps. Incision outlined. The vaginal wall below the transverse incision is first freed from the underlying structures and incised vertically. The vaginal wall above this incision is then freed and incised vertically.

Fig. 2. Vaginal incision completed. The plane between the pubocervical fascia and the vaginal wall has been defined by sharp dissection.

Fig. 3. The plane between the pubocervical fascia and vaginal wall has been followed upward and laterally to the pubic attachment by means of blunt finger dissection. The lateral fascial attachment is ruptured thus allowing the finger to enter the space of Retzius lateral to the bladder neck.

Fig. 4. The pubocervical fascia has been approximated in front of the bladder neck and upper urethra by means of interrupted mattress sutures. This elevates the bladder neck behind the symphysis and lengthens the urethra. As a result the bladder neck lies at a much higher level than is depicted in this drawing. One-half of a Penrose drain, 30 centimeters in length, has been placed in the space of Retzius on the left side. With a uterine forceps the operator is preparing to place the opposite half in the space of Retzius on the right side. The midpoint of the drain will lie under the bladder neck when the tubing is fully in place.

Fig. 5. Four triangles of vaginal wall have been excised. The vaginal incision is closed with interrupted sutures, with care not to include any of the underlying tissue or the Penrose drain.

clude any of the underlying tissue or the drain itself. A self-retaining catheter is placed in the bladder (Fig. 5).

The patient is then put in the dorsal position, prepared with merthiolate and draped. A long suprapubic incision is made curving to the left of, and extending slightly above, the umbilicus, exposing the external rectus sheath (Fig. 6). The incision is then draped with towels and clips. The rectus sheath at the bottom of this incision is cleared of fat to a width of 1.5 centimeters. The sheath is then incised just to the right of the midline, the incision being carried across the midline and just to the left of the umbilicus in the upper part of the wound. The septum between the two sheaths is cut and the fascia is then freed from the inner margin of the left rectus muscle to a depth corresponding to the area cleared of fat on its external surface. The length of such a strip has always been found to be more than sufficient. Too short a strip is a handicap which cannot be overcome. Great care must be taken in separating the rectus sheath from the underlying muscle at the lineae transversae, one of which is always found close to the umbilicus and sometimes another 2 to 3 centimeters below it. The muscle is closely attached to the sheath at these points and unless the separation is made carefully the fascia will be weakened enough to break on moderate traction. At this point the peritoneum can be opened, and any necessary surgery can be accomplished. If a complete hysterectomy is performed the upper prevesical fascia can be tightened if necessary by interrupted sutures or by excising a V shaped portion of upper anterior vaginal wall and ap-

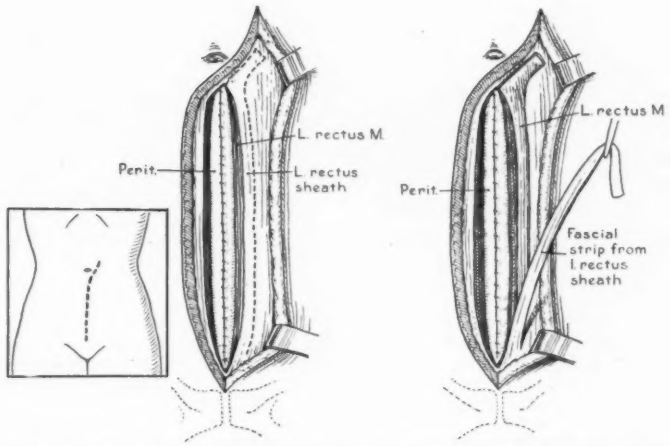


Fig. 6, left. Small inset shows character of skin incision. To left, the midline incision has been made just to right of midline. The external surface of the left rectus sheath has been cleared of fat and the septum between the sheath has been cut. The strip of fascia to be mobilized is outlined. The peritoneal incision has been closed following the completion of intra-abdominal surgery.

Fig. 7. The fascial strip has been mobilized, its lower end being attached about 2 centimeters above the symphysis.

proximating the cut edges with interrupted sutures, as advocated by Meigs. The peritoneum is closed after the completion of the pelvic operation. The mobilized rectus sheath on the right side of the incision is then freed by cutting from above downward along the left margin of its cleared surface (Fig. 7). The lower end is left attached about a centimeter above the symphysis. One of the pyramidalis muscles is frequently left attached to its internal surface. The anterior wall of the bladder with its pad of fat can now be separated from the posterior aspect of the symphysis. The ends of the Penrose drain are easily located on each side of the bladder neck and are withdrawn from the lower angle of the wound (Fig. 8). Traction on either end is sufficient to make the drain move easily through the tunnel under the bladder neck. The end of the fascial strip is placed inside the open end of the left arm of the tubing and secured with a ligature. This step makes a smooth joint which will not catch on any tissue. Traction on the right arm of the drain carries the strip about the bladder neck and out of the lower angle of the incision. The strip can then be secured to the margin of the lower right rectus sheath, by several interrupted sutures (Fig. 9). It should fit snugly about the bladder neck but should not be tight. The ligature securing the strip to the Penrose drain can now be cut, and the drain removed. The bellies of the rectus muscles are now approximated in the midline with three or four interrupted sutures. Several retention sutures are placed. The aponeurosis is carefully closed by two continuous sutures, one starting at the lower angle of the defect, the other at the upper. The two sutures meet at midportion of the incision where they are tied. The skin is closed with continuous dermal suture; a bolster is placed along the line of the incision, over which the retention sutures are tied. The use of sulfonamides in the wound has been abandoned.

After experience with both methods, it is believed that this procedure possesses definite advantages: (a) it is simpler, requiring only one change of position of the patient; (b) the plastic and abdominal surgery are consecutive and not simultaneous, reducing the number of assistants required; (c) breaks in aseptic technique are less likely to occur; (d) the fascial strip can be more accurately fitted to the

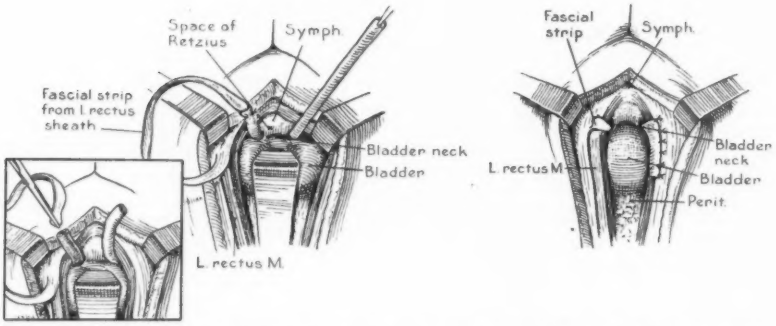


Fig. 8, Left. In inset, the bladder has been freed from the upper aspect of the symphysis. The ends of the Penrose drain have been located on each side of the bladder neck and have been delivered from the lower angle of the wound. The free end of the fascial strip is being introduced into the open end of the Penrose drain on the left. In the drawing proper the strip has been secured to the drain by a transfixion ligature, thus forming a smooth joint. It is being drawn around the bladder neck by traction on the right arm of the drain.

Fig. 9. The free end of the strip has been sutured to the right rectus sheath by interrupted sutures, thus forming a sling under the bladder neck. This sling should be snug but not tense. The Penrose drain has been removed. The abdominal incision may now be closed, great care being taken with the lower angle.

bladder neck; (e) the line of suture in the strip is remote from the undersurface of the bladder neck and at a point where all strain upon it from intra-abdominal pressure should be reduced by one-half; (f) any indicated lower abdominal or pelvic surgery can be carried out during the course of the operation; (g) it can be utilized without prior plan, if the residual supporting tissues are found to be attenuated during a plastic operation on the bladder neck.

POSTOPERATIVE CARE

After operation the patient is given 0.5 gram of sulfadiazine four times a day until the catheter is removed or until spontaneous voiding occurs. The catheter is irrigated once a day. It is removed on the ninth postoperative day, when the retention and skin sutures are taken out. No wound infections of major degree have been encountered. Two patients developed hematomas of the abdominal wound which required evacuation.

The resumption of normal voiding has been found to be much more delayed following this procedure than after the Aldridge type of operation. In the 15 patients operated upon by the latter technique 10 voided on the ninth day or before. Only 5 patients were unable to void following the removal of the catheter and all were voiding normally by the fourteenth day. In the 29 patients upon whom the present technique was carried out (including 1 patient reoperated upon, and excluding 1 who developed a fistua) only 5 voided immediately following the removal of the catheter; 16 were voiding 1 to 5 days later; 5 went 6 to 11 days; while 3 took even longer, 1 of whom was successful 23 days after the removal of the catheter. Various measures were undertaken to hasten the return of normal urination but none were notably successful. Cystoscopic examination of one of the most protracted cases showed no distortion of the bladder; in another there appeared to be a moderately elevated bladder neck. Since all patients eventually regained their ability to empty their bladder normally it would appear that many of them, having existed with a hair-trigger mechanism, sometimes for years, took time to learn to void after the bladder neck had regained stability. This long delay in the recovery of normal bladder function in a few of these patients proved to be a disadvantage from the point of view of prolonged hospitalization and because these individuals became greatly disturbed because of their disability.

These patients have been carefully followed. When successful results are attained,

the frequency and urgency of urination, often present 4 to 6 weeks after operation, disappear gradually. Usually no urinary symptoms are reported at the second visit which is made about 2 to 3 months later; the bladder neck is found tight behind the symphysis, with little or no descent on straining or coughing. When the bladder neck descends, incontinence will reappear and a failure result. Of the 15 patients operated upon with the modified Aldridge technique 11 (73+%) have shown satisfactory results; 7 (46+%) of them have been perfect, while 4 (26+%) still experience occasional slight loss of urine on extreme effort. The latter patients are satisfied and are unwilling to undergo further surgery. With the present technique 27 (90%) successful results have been attained in 30 patients; only 1 (3+%) of them states that she still has slight stress incontinence on extreme effort. Of the entire group 38 had total successful end-results, 86 per cent.

In regard to the failures, an opinion has already been expressed as to the defects of the procedure suggested by Aldridge. These are believed to be responsible for some of the failures following the use of this method. Of the 3 failures (10%) following the use of the present technique, 2 appear to be due to disruption of the reinforced support with recurrence of the urethrocele. One occurred because of a bladder neck fistula, caused by faulty dissection. Almost certainly the plane of cleavage between bladder and fascia was followed rather than the plane between fascia and vaginal wall. In addition the strip was pulled through the tunnel with narrow gauze packing which proved unsuitable because it caught in tissue. All of these errors can be avoided and should not recur if careful technique is followed. This fistula has been finally closed after one suprapubic and three vaginal operations, and it is regrettable to say that condition of the patient today is identical to her original state. One of the patients on whom the present technique was used developed a hernia of the lower angle of the abdominal incision. Extreme care must be used in the suture of this area because it is the most difficult part of the wound to bring into apposition.

The operative procedure described here is not presented with any idea of supplanting the widely used methods which employ a reconstruction of the original support of the bladder neck. The cases which have been described by no means represent the total number of patients with the symptom of stress incontinence operated upon during the same period. When the usual type of plastic procedure is employed an attempt is being made to predict its success or failure on the basis of age of the patient, degree of atrophy, the character of the residual pubocervical fascia, and the presence of factors producing excessive intra-abdominal pressure. It is only by learning how to make such an evaluation successfully that the failure of the usual plastic can be anticipated, thus avoiding the necessity of one or more secondary operations.

The results attained by reinforcing the reconstructed pubocervical fascia with transplanted abdominal fascia have not been free from failure. The majority of such failures have occurred during the evolution of an operative method. Most of them appear to be due to a defective technique rather than to an error in principle. The full technique, which has been described, has been utilized in the last 25 cases, successful results being attained in all patients with primary or recurrent urethroceles. The 2 failures both occurred in patients who had developed stress incontinence for the first time following the performance of extensive plastic operations. Four such patients were encountered in the entire group. No obvious explanation can be given for the difficulty in attaining a surgical cure in this type of case.

It is believed that the effectiveness of the procedure is dependent equally on a careful dissection and repair of the anterior pubocervical fascia and the support and reinforcement of this area by the fascial sling. The initial repair elevates the bladder neck behind the symphysis and restores the urethra to its normal length. The sling should increase the elevation of the bladder neck slightly, relieving the tension on the reunited pubocervical fascia; in healing it becomes incorporated in the pubocervical fascia, reinforcing the vulnerable area at which a recurrence of the

urethrocele can take place. It has been suggested that the sling causes a kink or stricture of the upper urethra, but no evidence of the latter has been found during postoperative catheterization or cystoscopy.

The permanence of the successful results can be determined only by prolonged follow-up. The first patient in whom the transplanted fascia was used was operated upon almost 3 years ago and shows a stabilized bladder neck with no tendency to descent. She is the patient whose history of four previous surgical failures has been quoted. It is to be hoped that the remainder show an equally good record.

SUMMARY AND CONCLUSIONS

1. The present day problem of the woman suffering from urethrocele and its accompanying symptom, stress incontinence, consists of:

a. The development of a method of surgical relief which will prove effective when simple plastic procedures have failed;

b. The evaluation of primary cases in regard to factors which may predispose to the failure of simple plastic procedures;

c. The use of a more effective operation in primary cases on the basis of such criteria, in order to anticipate failure by the simpler methods.

2. A surgical technique has been presented which it is hoped may solve this problem in some degree.

REFERENCES

1. Aldridge, A. H. Am. J. Obst., 1942, 44: 398.
2. Berkow, S. G. Am. J. Obst., 1941, 41: 1051.
3. Bonney, V. J. Obst. Gyn. Brit. Empire, 1923, 30: 358.
4. Dudley, E. C. Tr. Am. Gyn. Soc., 1905, 30: 3.
5. Frangenheim, P. Verh. deut. Ges. Chir., 1914, 43: 149.
6. Goebell, R. Zschr. gyn. Urol., 1910, 2: 187.
7. Johnson, H. W. Surg. Gyn. Obst., 1931, 53: 97.
8. Kelly, H. A. Urol. Cut. Rev., 1931, 17: 291.
9. Kelly, H. A., and Dumm, W. M. Surg. Gyn. Obst., 1914, 18: 444.
10. Kennedy, W. T. Am. J. Obst., 1937, 33: 19.
11. Ibid., 1937, 34: 576.
12. Ibid., 1941, 41: 16.
13. Mann, M. D. American System of Gynecology. 1888.
14. Miller, N. J. Am. M. Ass., 1932, 98: 628.
15. Murless, B. C. J. Obst. Gyn., Brit. Empire, 1938, 45: 67.
16. Stoeckel, W. Zbl. Gyn., 1917, 41: 11.
17. Studdiford, W. E. Am. J. Obst., 1944, 47: 764.
18. Ibid., 1945, 50: 119.
19. Thompson, R. Brit. J. Child. Dis., 1923, 20: 146.
20. Watson, B. P. Brit. M. J., 1924, 2: 566.

TWO HUNDRED AND FIVE CASES OF CANCER OF BREAST TREATED BY RADICAL MASTECTOMY

PAUL STIRLING PUTZKI, M.D., F.A.C.S., and JAMES H. SCULLY, M.A., D.Ed., M.D.,
Washington, District of Columbia

MANY valuable studies of cancer of the breast have been reported by large clinics where the statistics are usually based on the collected experiences of many. This is a report of 205 cases of cancer of the breast in which radical mastectomy, management, and follow-up have been carried out by an individual. All of these cases are from private practice. In most instances the patients were first seen by the referring practitioner. There has been no selection of our cases. All cases with adequate records, proof of diagnosis, and good follow-up have been included.

This study serves to emphasize the necessity for early diagnosis as well as to point out other factors which may influence the final results. All diagnoses are based on the microscopic examination of paraffin sections of tissue removed from the involved breast. In no case was aspiration biopsy tissue used as a means of diagnosis. In the management of the cases complete histories were obtained and complete physical examinations were made. In some cases information on these points was furnished by the referring practitioner; consequently, in such cases additional history and physical examination relative to the breast only were obtained. If metastasis was suspected, a preoperative roentgenogram of the chest or a metastatic series was made. Preoperative roentgen therapy was used in selected cases, but this was not a routine procedure. In all cases the basis of treatment for this disease was radical mastectomy. Postoperative roentgen therapy employed immediately upon recovery was carried out as a routine. The patients have been followed by office visits every 4 months, at which time a thorough history was taken and physical examination was made. Patients who had not visited the office for over 9 months were communicated with by telephone or correspondence. Simple mastectomies performed as a palliative measure for advanced carcinoma of the breast on elderly women, for foul smelling lesions, in severe cardiac disorders, and chronic debilitating lesions were not included in this series.

In this paper we wish to discuss the symptoms, physical examination, operability, treatment, pathology, irradiation therapy, metastatic lesions, and final results.

From the Department of Surgery, George Washington Medical School and the Department of Pathology, Georgetown Medical School.

SYMPTOMS

Table I enumerates the chief complaints or presenting symptoms noted. A lump in the breast was almost universally noted; in 88 per cent in our series. Many women complained of enlargement, swelling, soreness and pain in the breast. In most cases these findings were associated with a breast lump. Pain which attracts attention to so many conditions was present in only 31 cases. Sixteen women complained of discomfort in the breast. Pain in the breast occurring during the menstrual period is usually due to a benign condition. A stabbing, lancinating pain associated with a lump and slight tenderness frequently indicates that the lesion is a cyst. A dull ache or heavy feeling and discomfort may be due to a cancer. Pain in the breast may be due to pregnancy, mastodynia, abscess, mastitis, tuberculosis, involution, nipple disturbances and reflexly from pelvic pathology. There were 13 women who desired examination because of recent trauma to the breast. In all of these cases a malignant mass was discovered. It was felt that the trauma was coincidental and only served to focus attention upon the already diseased breast. Of course,

TABLE I.—SYMPTOMS NOTED IN 205 CASES OF CANCER OF THE BREAST

Symptons	Number	Per cent
Lump or mass in the breast	181	88.3
Enlargement or swelling of the breast	35	17.1
Pain in the breast	31	15.1
Soreness of breast	24	11.7
Discomfort in breast	16	7.8
Trauma to breast	13	6.3
Retraction of nipple	9	4.4
Discharge from nipple	9	4.4
Recent weight loss, more than 10 pounds	8	3.9
Annoying sensations in breast	6	2.9
Ulceration of skin of breast	4	2.0
Tenderness of breast	4	2.0
Itching of nipple	3	1.5
Itching of breast	2	1.0
Dimpling of skin of breast	2	1.0
Swollen arm	2	1.0
Eczema of the nipple and areola	1	0.5
Patients with two or more symptoms	104	50.7

we also have seen numerous traumatized breasts with no evidence of cancer.

Nipple discharges and crusting were mentioned by 9 women, one of whom tolerated the discharging nipple for 1 year. Eight women complained of rapid weight loss along with other more vague symptoms. Examination revealed a malignant breast tumor. There were 18 patients in this series who did not have breast symptoms or complaints. This is in conformity with the fact that early stages of infiltrating mammary cancer may be symptomless. There may be no pain, no discomfort, no enlargement of the breast. Therefore, the absence of tell-tale symptoms or the presence of a silent small, innocent-appearing lump in the breast must not lead us into false security. One hundred and four women presented two or more leading symptoms. The most frequent combination was a lump in the breast together with recent enlargement of the lump, pain or soreness.

Table II presents a time analysis of the 181 patients who complained of a lump or mass in the breast. Notwithstanding the seriousness of this, 36 of these women knowingly carried a lump in their breasts for 2 years or more without consulting a doctor; whereas, only 19 presented themselves for examination within a month after discovery of the breast tumor. On the other hand, an elderly woman had a breast lump 18 years and only because of

TABLE II.—LENGTH OF TIME THE LUMP HAS BEEN PRESENT IN THE BREAST—181 CASES

Lump in breast	Number	Per cent
Less than 1 month	19	10.5
One month to 2 months	40	22.1
Three to 6 months	26	14.4
Six to 9 months	35	19.3
Nine to 12 months	25	13.8
Two years	14	7.7
Over 2 years	22	12.2

recent rapid growth or enlargement of the lump did she consult a doctor. In 53.4 per cent a breast lump had been present longer than 6 months.

Even after we have discovered the breast tumor, either large or small, we cannot be certain of its age or extent of growth. We can be certain of the true nature of the tumor only by a microscopic examination after the tumor has been removed. Therefore, all tumors should be excised and microscopic study should be made to determine whether malignant change is present.

The knowledge of a breast condition was present in all these cases because the patients were either referred by practitioners or the patient was conscious of the breast condition herself. The fact that the lump had often been present in the breast for many months before treatment re-emphasizes the need for cancer education, for frequent periodical examination of the breast by the practitioner and for immediate pathological investigation.

Prognosis is definitely related to the presence or absence of glandular involvement, consequently, early diagnosis and early operation are most important. More than one-half the cases, 54.6 per cent, presented evidence of glandular metastasis at the time of operation. This is a high percentage of metastasis and it indicates that we are seeing some patients too late in the course of the disease to expect the best results from surgical treatment. Of these patients 62.9 per cent were between the ages of 40 and 59 years. Only 25.9 per cent were 60 years or more. The fourth decade was most frequently involved as well as the decade which had the highest percentage of metastatic involvement. In this series the fourth decade was the most vulnerable.

The 2 youngest patients were each 26 years of age.

TABLE III.—AGE DISTRIBUTION OF 205 CASES OF CANCER OF BREAST IN WHICH OPERATION WAS PERFORMED

Age	Number	Per cent	With glandular involvement		Without glandular involvement	
			Number	Per cent	Number	Per cent
25 to 29	3	1.5	1	0.5	2	1.0
30 to 39	20	9.8	11	5.4	9	4.4
40 to 49	65	31.7	39	19.0	26	12.7
50 to 59	64	31.2	38	18.5	26	12.7
60 to 69	40	19.5	18	8.8	22	10.7
70 to 79	12	5.8	5	2.4	7	3.4
80 to 89	1	0.5	0	.0	1	0.5
Total	205	100.0	112	54.6	93	45.4

One was a single girl with a massive painful tumor in the right upper quadrant of the right breast. A radical mastectomy was performed. The microscopic diagnosis was scirrhous carcinoma. There was no metastatic involvement of regional glands. She was given postoperative x-ray therapy to the breast and glandular regions (10 treatments to each of 4 portals). She was not castrated nor given hormonal therapy. She married within a year. She is well and in excellent health 4½ years after surgery.

The second girl was married and had 1 child 18 months of age.

She had a small, hard, painless nodule in the upper hemisphere of the left breast. Left radical mastectomy was done and the pathological microscopic report showed scirrhous carcinoma, duct cell type, without glandular involvement. She was given postoperative x-ray therapy to the breast and glandular regions. Ovarian function was not inhibited by surgery, roentgen ray, hormones, or other means. After 4½ years, she is well, in excellent health, and leading a normal life.

With regard to the position of the tumor in the breast, we found that well over 50 per cent were in the upper hemisphere and that the majority of these were in the upper outer quadrant of the breast.

The right breast was involved in 86 cases, 47.7 per cent. The left breast was involved in 94 cases, 52.3 per cent. The frequency of right or left breast involvement has no bearing upon the prognosis of the disease.

Complete information concerning hormonal therapy which patients may have received prior to mastectomy was not available.

Table IV shows that 78 per cent of our cases were married women and 21.4 per cent were unmarried. There were 65 per cent who have borne children and 34.4 per cent who were childless. Complete information on lactation and nursing was not available. These figures are relative and not a true index of what can be expected in the population at large.

TABLE IV.—CANCER OF THE BREAST—205 CASES

	Percentage
Married—Multiparas	65.0
Married—Nulliparas	13.0
Single women	21.4
Males	.6

PHYSICAL EXAMINATION

A thorough history of the condition can be diagnostic or misleading. In itself a history is not sufficient. A physical examination of the breast must be done. There are no special types of patients nor special types of breasts with propensities for cancer of the breast. Cancer may occur anytime after puberty.

For the purpose of examining breasts a special room was set up. This includes a reclining chair which permits easy examination of the patient in various positions. A dark room permits transillumination and lighting for shadow effects. There are also facilities for aspirations, redressings, and so on.

The breast is first inspected with the patient exposed to the waist. One breast is always compared with the other as to appearance, size, shape, and regularity of outline. Any changes from the normal may be due to a pathological condition. Flattening, dimpling, or wrinkling of the skin may be brought out by oblique lighting, shadow effects, by having the patient raise her arms overhead while casting low intensity light across the breast. Restricted mobility of the mass or fixation to the skin is due to atrophy of overlying or surrounding fat and fibrous attachment of the mass to the skin, fascia, or underlying muscles. Retraction or elevation of the nipple to one side is suggestive of cancer. The condition of the nipple is observed. It may be crusting, ulcerated, or discharging. Discharges from the nipple may be bloody, serous, white and greenish. Microscopic examination from nipple discharges are made to determine if red blood cells are present. Chocolate colored discharges which sometimes occur in chronic

mastitis could be erroneously described as bleeding from the nipple. In papillary cystadenoma there may be a bloody discharge from the nipple resulting from an intracystic hemorrhage. A cystadenoma may be confused with a carcinoma because it occurs in the third and fourth decades. It is a hard, nodular, painless mass which is opaque to transilluminated light. It is movable and usually does not have the fixation of cancer. It is generally centrally located and feels deep within the breast on palpation, whereas, carcinoma feels superficial on palpation. Trauma to the breast may produce a hematoma with bloody discharge from the nipple simulating a tumor. In 13 cases of this series the trauma was to a pathological breast; consequently, nipple discharges could be misleading if it was assumed that the discharge was due only to trauma. In most cases, however, it is a normal breast which is traumatized. Bloody discharges may be due to a duct papilloma, duct cancer, or cancer starting in the acini. The bleeding is spontaneous and intermittent and associated with a hard, solid tumor. It may also be due to sarcoma, Paget's disease, cracked nipple and trauma. Discharges other than bloody are frequently seen in mastitis, abscess, involutional cysts and other conditions. Greenish discharges may be seen after lactation due to inspissated milk. A whitish discharge may be due to milk, pus, cysts, or malignant growth. Any discharge from the nipple may be serious, thus a careful examination of the breast and the discharge is necessary to determine the presence of a tumor. Often surgery will be required to determine the exact nature of the lesion.

Palpation may be done both with the flat of the hand and the tips of the fingers. Hard nodules which can best be appreciated with the flat of the hand are often scirrhous carcinoma. They may be fixed to the deep fascia and later to the skin. Local flattening or general shrinkage of the breast may be noted. Local flattening suggests cancer; whereas, focal prominence suggests a benign tumor or cyst. Slight dimpling of the skin due to lymphatic edema often occurs early. Changes in the position of the nipple or in the appearance of the skin overlaying the tumor are usually late signs in mammary cancer.

Involvement of the large milk ducts is responsible for fixation and later actual indrawing of the nipple. Retraction of the nipple is very suggestive of early duct cancer or advanced carcinoma elsewhere. Drainage from the nipple is rarely seen in early cancer.

Cysts are round, smooth, fluctuant, well circumscribed and not fixed. Fibroadenoma may be round, smooth, hard, and palpated best with the tips of the fingers. Cancer is hard, irregular, and adherent to neighboring tissue. Early deep abscesses of the breast can be confusing. There may be no elevation of temperature and only slight redness of the overlying skin. They may respond to chemotherapy or they may have to be incised and drained. The abscess gives the feeling of diffuse deep tumor. Undue manipulation, palpation, and squeezing of the breast does not aid in diagnosis and adds the danger of producing metastasis.

TRANSILLUMINATION

Normal tissue transilluminates well. Cysts filled with clear or cloudy fluid and small tumors transilluminate various degrees of light. Blood vessels, bleeding tumors in which there is usually a cyst filled with blood, are opaque to transilluminated light. Dilated ducts distended with inspissated secretions, thick walled cysts, solid tumor, carcinoma, and fibroadenomas over 2 centimeters in diameter will cast shadows. Small malignant or benign tumors may not cast a shadow. Breasts are best transilluminated with patient in the sitting position; however, other positions may yield more satisfactory results in some cases.

We have not used the roentgen-ray soft tissue technique for diagnostic purposes in breast lesions. In some cases the roentgenologists have carried out this procedure for their own edification. For our purposes we did not feel that these procedures have been sufficiently developed to justify clinical use, particularly when microscopic examination would be performed in any case.

In most cases of anticipated radical mastectomy a roentgenogram of the chest and skeleton was made to check for possible metastasis. The x-ray findings were considered in the determination of operability.

Aspiration biopsy, that is, the withdrawing of tissue for microscopic diagnosis, was not employed. It was felt that this was not an adequate procedure because the diagnosis was not always reliable. Aspiration of fluid in benign cystic conditions has been performed but is not considered in this paper.

OPERABILITY

In this series the types of lesions and the criteria of operability were as follows:

1. Any lesion of the breast which clinically appeared to be carcinoma and in which this diagnosis was confirmed by gross appearance and frozen section or the Terry stain.

2. Any cancer of the breast with or without axillary nodes unless the nodes were large and fixed to the surrounding tissue.

3. Any lesion which was freely movable from the thoracic wall regardless of ulceration.

4. Lesion which showed no evidence by roentgenogram of metastatic involvement of viscera or skeleton.

5. The chance of curing the patient or offering comfort and a greater length of life must be reasonably assured.

The pathological findings contraindicating operative treatment were:

1. Roentgenographic evidence of skeletal or visceral metastases.

2. A palpable, large, nodular liver.

3. Large growths which were fixed to the thoracic wall.

4. Extensive metastases to axillary lymph nodes, supraclavicular nodes and other regional nodes, and to other parts of the body.

5. Fixation of axillary glands with edema of the arm.

6. Signs indicating far advanced disease.

7. Skin metastasis beyond the area of the tumor.

8. Bilateral breast carcinoma.

9. Diffuse types of malignancy if at all advanced.

The decision to operate is a matter of experience and judgment. No arbitrary set of rules can be set forth and adhered to without flexibility. The justification has been found in patients who were considered hopeless but following operation have enjoyed many comfortable years.

TREATMENT

Every patient deserves the benefit of treatment. Although we have had no operative mortality we believe that no patient should be subjected to operative treatment, risk, and disfigurement without having the diagnosis definitely proved by a preoperative biopsy and microscopic examination. The final results of treatment will depend upon the extent of the lesion at the time of operation, the thoroughness with which the operation is performed and this includes axillary cleaning, the age of the patient, and the grade of malignancy.

Small lesions of the breast without glandular involvement are most favorable for treatment. Larger lesions with glandular involvement are less favorable. With the advance of metastasis we approach the inoperable stage.

Radical mastectomy followed by postoperative roentgen therapy was the basis of treatment in this series.

In selected cases preoperative roentgen therapy was used. In some instances it produced a false security. The tumor disappeared under the irradiation and the patient refused to proceed with surgery. Let us cite one such experience:

Mrs. E. A., a prominent and intelligent woman of 33 years, the mother of a 6 year old child came to us with the complaint of a lump of 2 years' duration, in her left breast. The mass was symptomless. About 2 months before her visit the mass became larger with a puckering or dimpling of the skin over it. Clinical examination revealed a hard, irregular, freely movable, superficial mass about 2 by 2 centimeters with orange-peel type of skin over the mass and fixed to the mass. The tumor was opaque to transilluminated light. There was a small freely movable, left axillary lymph node. A roentgenogram of the chest was negative. The clinical diagnosis was carcinoma of the left breast with axillary metastasis.

Under preoperative roentgen therapy, which was started the following day, the mammary tumor and axillary node disappeared. The roentgenologist stated: "We thought because of the small dose of x-ray necessary to bring this about that we were dealing with mastitis."

With the disappearance of the tumor the patient refused to proceed with surgery. She did consent to follow-up visits for about 1 year. Then she refused to submit to further observation because she considered herself cured. Within another year and less than 2 years from the time we first saw her, she had extensive metastasis to the bones. She was having much pain and great discomfort. The same roent-

genologist then stated "We are obviously dealing with a type of malignancy." It was now too late to give her any aid through surgery. She went right on to die.

Preoperative roentgen-ray therapy adds to the discomfort of the patient and produces a long delay before operative treatment can be instituted. It is often 4 to 6 weeks during which time metastasis may have its start. In some cases a pleuropulmonitis has been produced. A positive diagnosis of cancer cannot always be made, particularly in early cases. One is not sure what the true condition is. Alleged cures may not have been cures at all. Tolerance of the patient for additional irradiation may be unnecessarily lowered by giving treatments to unproved conditions thus hindering further postoperative treatment. If preoperative irradiation is to be undertaken after biopsy tissue of the tumor has been removed, the surgeon would do better to proceed with radical mastectomy rather than to close the incision, then to proceed with irradiation, and again later return to surgery.

To obtain biopsy material by incision the patient is prepared as for a radical mastectomy. The arm of the affected side is held on an arm board at 90 degrees' abduction. Under pentothal gas anesthesia the incision to secure biopsy material is made. The tumor, with a good sized margin of normal tissue and overlying skin is excised without squeezing, manipulating, clamping or spilling it. The gross section is examined with the pathologist present. A typical cut section of the gross specimen of scirrhous carcinoma, and such growths comprised the type of tumor found in most of our cases, showed a grayish, irregular, firm, gritty mass which was firmly adherent to the surrounding tissue and which sent fibrous streaks shooting into the fatty tissue. The section may be homogenous or it may show the pale yellow dots and streaks of necrotic cells. The cut surface is usually concave. Small cysts are infrequently seen.

Frozen section or Terry stains of the specimens are made immediately. If the microscopic diagnosis reveals a benign lesion, surgery consists of excision of the tumor. If the pathologist reports a malignant growth, surgery consists of radical mastectomy.

The technique of radical mastectomy has been fairly well standardized since the turn of the century. Individual surgeons have employed variations of technique and thoroughness in removal of tissue. In our clinic the operation consists of the amputation of the breast, together with the removal of the pectoralis muscles and a clean dissection of the axillary and subclavicular region. The entire mass is removed *en bloc* to safeguard against transplantation of malignant cells; such transplantation may occur by traumatic or mechanical dissemination of cells within the operative field. Intravenous fluids are not employed during operation or subsequently, as a rule. In no case was severe shock seen at the time of the operation or later.

The type of incision utilized and the amount of breast tissue removed depend on the location of the tumor in the breast, type of breast, size of the breast, and the bodily build of the patient. A wide skin incision is essential if local skin recurrences are to be avoided. Wide superficial and deep fascial removal is likewise important. Many recurrences come from this fascia. All skin around the breast and as much as possible about the tumor are removed. In some cases wide skin grafting has been necessary.

It has been wisely said that one surgeon should be charged with the most radical removal of the tumor and another should be responsible for the closure of the wound; thus the thoughts of closure would not hamper the operating surgeon in the radical excision of tissue. Generally, we have employed a transverse elliptical incision encircling the breast and extending from the posterior axillary line about 10 centimeters below the axilla to the lower midsternum. A second incision at right angles to the transverse incision is carried upward to the shoulder about 3 centimeters medial to the anterior axillary line. This incision provides good mobility of the arm with very little limitation. With this type of incision we have had no axillary cicatricial contractions. Painful contracting scars can be produced by irradiation as well as by improperly placed incisions. Edema of the arm as an aftermath has seldom occurred. Transient and intermittent slight edema of the arm due

to lymph blockage has occurred and this is expected. Thorough cleaning of the axilla will produce some lymph edema. Venous obstruction which may result from pressure on the axillary vein by scar formation has not occurred. The incision permits the maximum removal of skin about the breast. It provides desirable exposure of the axilla which aids in thorough axillary cleaning, removal of the pectoralis muscles, and cleaning of the chest wall. It aids in getting good closure and prevents cicatricial tissue formation in the anterior fold of the axilla. Elliptical incisions along the anterior axillary fold as well as other types of incisions have been used but only in cases in which the transverse incision has not been applicable. The skin incision is made into the subcutaneous tissue, and the flaps are dissected free by undercutting close to the skin to prevent local recurrences and deposits of cancerous cells in the superficial lymphatics.

Hemostasis has been secured by means of plain catgut ligatures or by electrocoagulation of bleeding points. The latter method reduces the operative time. About the same amount of serous fluid has been collected in the wound by either method.

The pectoralis major is severed at its attachment on the humerus and then is separated from the clavicle and retracted downward and medially. The coracoclavicular fascia is incised and the pectoralis minor muscle is severed at its insertion on the coracoid process. This muscle and the pectoralis major are then retracted downward, thus exposing the axilla. The dissection of the axilla is begun at its apex, progressing from above downward removing fatty tissue, lymph glands, vessels, and areolar tissue in the process. Axillary cleaning is important because lymphatic permeation is the all important method of spreading the disease not only locally but also at a distance. This procedure permits the removal of all of the structures including the breast, the pectoralis major and pectoralis minor muscles, pectoral fascia and axillary contents in one mass. The chest wall is cleaned thereby diminishing the liability of malignant cells spreading into the adjacent tissues. Throughout the surgical procedure hot moist tapes are used over all exposed tissue. This step prevents rapid cooling of the body, aids in hemostasis, prevents overmanipulation of tissue, aids in exposure and in the prevention of shock.

Primary closure with interrupted steel alloy sutures has been used in recent years. Prior to that time interrupted cotton sutures were used. The wound has been closed tightly without drainage. Tension sufficient to produce necrosis beneath the sutures is seldom employed. If skin grafts are needed a thick split skin graft is taken from the anterior thigh. A small incision in the axilla, closed with a single suture, will serve as a drainage area. On the third postoperative day this incision is opened to permit drainage of accumulated serum and blood. Closure in the manner described permits the patient to be ambulatory early, the wound to be kept closed, air to be kept out, the dressing clean, less frequent changes of dressings, control of drainage, and finally the patients like it.

After operation the arm of the affected side is suspended upright by traction on the forearm, the upper arm being kept in 90 degree abduction and the forearm at right angles to the upper arm. Gradual motion and exercise is encouraged from the outset. In 3 or 4 days the traction is removed, and the patient has little or no limitation of motion of the extremity and no postoperative swelling. The patient is out of bed on the fourth day or fifth postoperative day. Within 7 to 10 days the wound is healed, sutures have been removed, drainage has stopped, and the patient is ready for postoperative irradiation.

PATHOLOGY

TABLE V.—PATHOLOGICAL DIAGNOSIS IN 205 CASES OF CARCINOMA OF THE BREAST AS REPORTED BY PATHOLOGISTS

Carcinoma reported	Number
Scirrhous carcinoma	111
Infiltrating duct carcinoma	31
Adenocarcinoma	21
Simplex carcinoma	16
Medullary carcinoma	9
Papillary cystadenocarcinoma	4
Comedo cancer	4
Colloid carcinoma	3
Solid type carcinoma	2
Paget's cancer	2
Acute inflammatory carcinoma	2

Table V presents a list of the types of breast cancer by name and in the order of frequency as reported by pathologists in the hospitals of this city. It is not a classification. It is realized that two or more of these diagnoses may occur in the same breast. One section may show a scirrhous carcinoma while another may show a duct cell type carcinoma. The microscopic diagnoses were from plugs of tissue made into paraffin sections. There were no whole organ diagnoses.

Some pathologists reported the grade of malignancy and others did not. Consequently, there has been no tabulation of this information. The table shows an overwhelming number of scirrhous carcinomas. This type of growth is the slow growing and radioresistant cancer. The 31 cases of infiltrating duct cancer may be considered in the same category as the scirrhous carcinoma. There were 21 cases of adenocarcinoma. These growths are of relatively low malignancy and remain localized for a long time. Axillary node involvement is exceptional. Grossly the adenocarcinoma is a bulky, soft tumor. There were 9 cases of medullary cancer, which is a rapidly growing tumor and often invades the skin, ulcerates, and appears on the surface as a large, fungating mass. We had 2 cases of acute inflammatory cancer.

One was that of a well developed, well nourished woman of 35 years who had two children. One child was 4 years of age and the other a newborn. In the terminal weeks of her second pregnancy she developed a slight hardness and enlargement of the left breast. After delivery the swelling and hardness persisted. The breast became tender and painful. The pain was generalized and grew progressively more severe. We first saw her 6 weeks after the onset of symptoms and at this time the left breast was enlarged, hard, reddish, and very tender. It was opaque to transilluminated light. There was a hard, round, freely movable gland about 1 centimeter in diameter in the left axilla. The roentgenogram of the chest was negative. She did not nurse the newborn baby. A left radical mastectomy was done with extensive removal of skin tissue and extensive cleaning of axillary and clavicular regions. A large skin graft was taken from the thigh to cover the left breast area. The pathological diagnosis revealed infiltrating duct carcinoma, grade III, with metastasis to regional lymph nodes. Postoperatively, she was given roentgen therapy to the left breast, axillary, and clavicular regions. She was sterilized by the roentgen therapy and supported with testosterone propionate. Six months after surgery she appeared to be in fair condition. She has maintained her weight and there is no evidence of metastasis but she has had a difficult time with the pain and the discomfort of roentgen therapy. Prognosis is poor in her case. The increased vascularity and cellularity of the mammary gland, the intensified endocrine influence, the rapidity of growth, the diffuseness of the growth, the glandular involvement, the grade of malignancy give us cause for pessimism in the prognosis of this case.

ROENTGEN THERAPY

We have employed postoperative irradiation and irradiation for recurrences or metastatic carcinoma as a routine. In some cases in which the disease was well within the limits of surgical dissection postoperative roentgen therapy was not given. In selective cases we have employed irradiation castration. This phase of therapy is probably most beneficial in cases with metastatic involvement. Irradiation extends the margin of safety and prevents or inhibits recurrences from malignant cells which may have been spilled in the wound or were present in places inaccessible to surgery. The results obtained with roentgen therapy will depend upon the pathological histology, the radiosensitivity of the tumor, the extent of involvement, the bodily build of the patient, clinical course of the disease and other factors. In general, the technique of divided dosage has been used especially when the disease has spread beyond the limits of the involved mammary gland itself. Thus the margin of safety is extended to the parasternal axillary, and clavicular regions.

Irradiation has been initiated within 2 weeks after operation. It has not interfered with healing and has not delayed convalescence. Scirrhous carcinoma is highly radioresistant as are most tumors that are markedly desmoplastic. The highly cellular medullary form may be quite sensitive to irradiation. Adenocarcinoma and duct carcinoma do not respond well. The rapidly growing anaplastic forms respond best, but as they metastasize at an early date they have the worst prognosis. The large amount of fat in the breast is a formidable barrier to irradiation. The outlying islands of tumor cells are very apt to escape unharmed. Microscopic sections of tissue removed at the time of surgery show that the lymph nodes on the anterior surface of the

pectoral muscles are involved in many cases of scirrhous carcinoma at the time of operation. Such nodes are hard to reach with irradiation alone.

Irradiation castration in premenopausal women was employed in selected cases. Irradiation of ovaries has been used to eliminate the ovarian estrogenic function, prevent pregnancy, and the physiological process accompanying pregnancy. This has not been a routine practice because it is felt that the benefits are temporary. Menses often reappear and the ovarian function re-establishes itself. The ordeal is most uncomfortable and it produces many complaints from patients and not a little emotional and nervous upset. Many patients have stated that they would prefer another operation rather than submit to further irradiation. Notwithstanding these apparent disadvantages we have continued with irradiation castration and have not employed surgical castration. In some instances the patients have been supported with testosterone propionate. Massive dosage of 100 milligrams or more daily are required to inhibit estrogen function and give palliative relief. At the present time the cost of this drug in the required dosage is prohibitive to most patients.

FINAL RESULTS

There were no operative deaths and no cases of shock. This fortunate circumstance was favorably influenced by the maintenance of good standards in determining the operability of patients as outlined, by proper preoperative preparation, by competently administered, suitable anesthesia, by hemostasis, the use of hot tapes during the operative procedure, by the avoidance of shock and by the employment of atraumatic surgery as much as possible. No fluid was administered intravenously during the surgical procedure. In 30 patients operated upon within 3 years there was no metastatic involvement. Two, or 7 per cent, of these died of recurrences of the disease. Thus 93 per cent of those operated upon within the past 3 years are living and well. Of the 60 without metastatic involvement who have been operated upon more than 3 years ago, 49 are living and well. For those without metastatic involvement and who were operated upon more than 3 years ago the percentage survival rate is 83.3. If operated upon more than 5 years ago the percentage rate is 80.1.

TABLE VI.—FINAL RESULTS IN 205 CASES OF CARCINOMA OF THE BREAST

	Without metastasis	With metastasis
Operative deaths	0	0
Living and well but operated on less than 3 years ago	28	31
Total deaths from recurrence of those operated upon less than 3 years ago	2	7
Living and well more than 3 years	14	11
Living and well more than 4 years	9	9
Living and well more than 5 years	27	19
Deaths from intercurrent diseases	3	4
Total deaths from recurrence of the disease more than 3 years after surgery	10	31
Percentage survival of those operated upon less than 3 years ago	93.3	81.6
Percentage survival of those operated upon more than 3 years ago	83.3	55.7
Percentage survival of those operated upon more than 5 years ago	80.1	51.4

With metastatic involvement the results are less favorable. There were 38 patients with carcinoma of the breast with metastatic glandular involvement who were operated upon within the past 3 years. Seven, or 18.4 per cent, of these have died of recurrences. There were 74 patients with metastatic glandular involvement who were operated upon more than 3 years ago. Thirty-nine of these are still living and well. Of those with metastatic involvement who were operated upon more than 5 years ago 51.4 per cent are living and well. Table VI shows that the results are much better when patients are operated upon before glandular invasion has occurred.

RECURRENCE AND METASTASIS

Sooner or later after carcinoma of the breast has been treated the disease may again manifest itself. Treatment as we have mentioned will retard and delay recurrences and metastases. In 1 case of carcinoma of the breast treated with radical mastectomy the metastasis became clinically evident 12 years later.

One wonders if this was a recurrence, a metastasis, or a new-growth independent of what has gone on before. When metastasis occurs it becomes the duty of the physician to use means at hand to combat the growth, prolong life, give comfort and encourage a cheerful outlook.

Bone, visceral, and skin metastases may occur from any grade of breast cancer. The metastasis is a manifestation of the generalized extension of the disease throughout the body. The extension may have taken place by lymphatic extension, by permeation, by lymphatic emboli, by embolic dissemination and by way of the blood stream. The most frequent osseous structures involved are the vertebrae and pelvic bones and the most frequent visceral involvement are the lungs and abdominal organs. Pain usually is the first clinical warning of the presence of cancerous tissue in bones. The pain is caused by involvement of the periosteum or adjacent nerve trunks with metastasis or surrounding inflammatory reaction. Visceral metastasis to the pulmonary, pleural, and mediastinal structures will manifest itself with pleural effusion, cough and pain, dyspnea and orthopnea. When abdominal organs are involved there usually is an abdominal mass with ascites. In the skin we find carcinomatous dermatitis with skin nodules of various sizes, some of which may ulcerate. Roentgenograms are taken if complaints of pain and other evidence suggest the possibility of metastasis. Irradiation can be applied to structures involved by cancer which are inaccessible to surgery. Palliative measure may include tapping of fluid in serous cavities, irradiation, hormonal therapy, excision of skin nodules, relief from pain, sedation and psychosomatic therapy.

SUMMARY

Routine and frequent examination of the female breast is the key to discovery of much early mammary carcinoma. All breast tumors with the exception of the simple cyst which totally disappears on aspiration should be removed surgically and a pathological diagnosis made.

A lump in the breast was the most frequent indication of carcinoma in our series; 88.3 per cent had this complaint. Over 50 per cent of the patients knowingly possessed a lump in the breast more than 6 months before submitting to treatment. The fourth decade was the most vulnerable to carcinoma of the breast, both as to frequency and metastatic glandular involvement. In 54.6 per cent of the cases the regional lymph glands were involved with metastases. Surgical biopsy and microscopic diagnostic examination were carried out preoperatively in all cases. Routine treatment consisted of radical mastectomy and postoperative irradiation. The surgical technique permitted maximum removal of tissue *en bloc*. Removal was done through a transverse elliptical incision which encircled maximum skin tissue and breast tissue about the tumor. A second incision is made at right angle from the first upward to the shoulder. The pectoralis major and minor muscles were removed, and thorough cleaning of the axilla, clavicular regions and chest wall was done as part of the surgical procedure.

Postoperative irradiation was carried out as a routine. In selected cases preoperative irradiation and irradiation castration have been employed.

The final results show that those operated upon prior to metastatic involvement live longer and the prognosis is much better. In cases without metastasis there was a 93.3 per cent survival rate for those operated upon within 3 years and an 80.1 per cent survival rate for those operated upon more than 5 years ago. Whereas in cases with metastatic involvement the survival rate for those operated upon within 3 years was 81.6 per cent and for those operated upon more than 5 years ago the percentage survival was 51.4 per cent.

Metastases to bone and viscera take place equally well. Once metastasis has occurred the outlook is usually poor and it becomes necessary to use palliative means to keep the patient comfortable and cheerful.

RECONSTRUCTION OF BONY DEFECTS OF THE FACE

With Special Reference to Cancellous Iliac Bone

DOUGLAS W. MACOMBER, M.D., F.A.C.S., Lieutenant Colonel, M.C., A.U.S., Denver, Colorado

DEFINITIVE phases of war surgery have indicated functional and cosmetic restoration of damaged and destroyed bone. A conspicuous portion of such surgery is concerned with facial and cranial structures. Vast numbers of cases, many with aberrations and complications rare or unknown in civil practice, have afforded an unprecedented opportunity to appraise several methods of treatment. In one of the Army's plastic and maxillofacial surgery centers during the past year we have performed approximately 200 operations requiring replacement of bone and restoration of contour in the face and jaws. Adequate data are now at hand for a fair comparison of substances and tissues used and techniques applied. The purpose of this paper is to review our experience with tantalum, acrylic, homogenous and autogenous cartilage, and bone. Evidence indicates that cancellous iliac bone is the substance of choice in the repair of the majority of such defects, large and small. The chief exceptions are large soft or pulsating cranial defects, which are being so successfully covered by tantalum plates. However, numerous depressed skull fractures and contour defects common about the frontal processes, orbital rims, malar and zygomatic regions are effectively corrected with relatively simple cancellous bone grafts. Results have been uniformly good, even in areas badly crushed, septic until recently, or complicated by foreign bodies.

TANTALUM

Success of neurosurgeons in applying accurately prefabricated metal plates to cranial defects led a predecessor to attempt their use in camouflaging depressions incidental to irreducible malar fractures. Immediate cosmetic effects were fair in several cases, but septic reactions and displacements demanded their early or ultimate removal in all but 3 cases. To our knowledge, about 1 out of 2 patients was dismissed with the plate in place; in the other cases the operation was redone with bone or cartilage. Not insignificant were patients' complaints of sensations of cold upon exposure during cold weather. Thus, this method of dealing with facial contour defects was abandoned.

From the Department of Plastic Surgery, O'Reilly General Hospital, Springfield, Missouri.

ACRYLIC

Observations upon acrylic implants are very limited. The eye department is pleased with results from wedges of the substance in damaged or depressed orbital floors to elevate the globe of the eye. There is a possibility of these bodies eroding into the antrum in case of tissue reaction where bone is missing and much fibrous tissue present. No such instances have occurred, however, and the patients are improved cosmetically and functionally. For the sake of discussion, however, the plastic surgery department contends that all of us would feel more confident in utilization of a viable substance, such as cancellous bone, in precarious locations.

One officer patient presented himself with the lower end of an acrylic implant protruding from his left nostril. It had been inserted overseas to correct a traumatic saddle nose. There was no evidence of sepsis, but the nasal mucosa apparently had undergone a pressure necrosis and given way. Certainly this would not have occurred over viable autogenous tissue.

It may be safe to predict that indication for this means of tissue support will be limited to very few cases.

FASCIA LATA, FAT, AND DE-EPITHELIALIZED SKIN

For small depressions—where protection of underlying structures, rigid support, or strength

Fig. 1, left. Irreducible depressed malar fracture with bone loss.

Fig. 2. Correction of contour and restoration of orbital rim with cancellous bone. Graft was not wired in place; it was inserted into a pocket against freshened bone of recipient site.

are unimportant—fascia lata serves admirably. One or two strips taken with the fascia stripper may be tucked into the depression through a tiny incision, distributed and modified as requirements indicate. It is found that overcorrection is not necessary, since shrinkage or absorption is negligible.

Apparently fat has been practically abandoned as a free graft. It seems not to be readily vascularized, has low resistance to infection, is prone to absorption and fibrosis. Thus danger of unpleasant immediate complications is great; central portions of large grafts are subject to liquefaction and necrosis; the degree of absorption is unpredictable. Certainly there has been no indication, to our knowledge, for the use of free fat in war surgery.

However, fat as a small attached local rotation or sliding subcutaneous flap has served us well for correction of innumerable small depressions. Penetrating, perforating, and lacerating wounds of the face, with varying amounts of tissue lost, have resulted in every manner of superficial defect. Grooves, furrows, pits and depressions catch lights and shadows in such a way as to accentuate their importance, especially to sensitive patients. In depressions involving the beard area, the chief complaint is inturned hairs and interference with shaving.

Practically anywhere on the face it is possible to draw a pedicle of adjacent attached fat into a small depression without noticeably or objectionably altering contour of the area. It may be preferable to use figure-8 or other removable stitches to hold the pedicle in place until it is established, rather than to chance irritation or foreign body reaction to buried suture material.

Previous literature has recommended and evinced a moderate amount of enthusiasm for skin minus its epithelium for filling shallow depressions or for strengthening so-called weak integument. It is my impression that it cannot do anything that fascia lata or other tissue cannot do better and with less danger of sepsis and absorption. One cannot be certain that all secreting and excreting elements of the skin have been removed. Tissues that have survived the inestimable crushing and concussion of a war injury may be less able to cope with factors which complicate or retard healing than are tissues that have endured less violent trauma. We have had no occasion to use this technique in any of the depressed areas and have dismissed it as impractical, at least in a series of this type.

CARTILAGE

Obviously cartilage is established as a tissue of choice in many defects, particularly nasal depressions and ear reconstructions. The only debatable phase of the question seems to be whether the cartilage shall be homogenous or autogenous. Advocates of the former contend that it is preferable wherever cartilage is indi-

Fig. 3, left. Large bony loss beneath superficial defect now occupied by pedicled flap graft.

Fig. 4. Lower orbital rim, malar bone, and zygomatic arch have been replaced by one large block and several smaller fragments of cancellous bone.

cated, chiefly because it saves the patient an uncomfortable incision over the costochondral region and because it is less apt to twist or curl. Other considerations being at least equal, we have preferred preserved cartilage because of its saving us the additional surgery to procure autogenous substance. It may be stated conservatively that utilization of the preserved tissue saved us at least 70 operations during 1945. Considering the fact that 3500 operations were carried out in the plastic surgery department of a single hospital during this period, we grant that such a time saving consideration enables us to perform an increased total number of operations. We have buried many plates of preserved cartilage beneath the skin about burned and partially destroyed ears and placed split skin grafts behind them a few weeks later with practically no disappointments. Even in instances in which scar epithelium looked as though it might break down if undercut, the skin has survived and improved as it has contributed to the reconstruction of an ear. These ears appear to be substantial and so far as we know the cartilage is showing no tendency to be absorbed. I recall 2 instances of cellulitis which subsided without loss of the cartilage and 2 instances of gross infection, mentioned later, in which it was expelled or removed. It will be interesting to note whether any of these patients suffer absorption or expulsion of the graft in the future. After all, preserved cartilage is nothing more than a benign foreign body. A previous generation of surgeons favored ivory—and some of it did its work quite well for years. In 1943 in the European theater I removed an ivory implant, from one of the older Air Corps officers, that had been placed in his traumatic saddle nose following an airplane crash in World War I. It had become displaced and had festered periodically during the past 3 years. Dorsal and columellar elements were ingeniously dovetailed together like an intricate Chinese puzzle. There was no evidence that time had in any way impaired the material. After a few weeks this nose was successfully built up with a cancellous iliac bone graft.

Since the type of work done in this military hospital is rarely followed by a death, we have had no opportunity to collect any cartilage from the department of clinical pathology. Thus we came to depend upon other institutions to procure for us the material from suitable donors under aseptic precautions. We cultured the material, transferred it to new merthiolate-saline solution and refrigerated it. Repeated cultures were made on any specimens kept over 2 weeks; they were discarded if other than "no growth." Despite these precautions we had 4 cases of infection from one batch of cartilage in the only 4 patients in whom it was used. Drainage from each of 2 ear grafts and 2 nose grafts gave a culture of hemolytic Staphylococcus albus. The ear grafts were lost but the nose grafts retained, with some absorption in one and no tangible change in the other. We have not used any preserved cartilage since this experience, and probably will not unless a more dependable source becomes available to us. For small ear cartilage grafts, we take some from the opposite concha in unilateral cases. In instances requiring larger grafts we are making the costochondral incision. For supporting substance elsewhere than the ear, we prefer cancellous bone in most cases. Thus the number of rib cartilage incisions is not a burden to us or to the patients at this time.

Fig. 5, left. Depressed fracture of frontal bone.
Fig. 6. Result from insertion of one large and several smaller pieces of cancellous bone. Note incision above hairline.

CANCELLOUS BONE

Various comments in the above sections indicate the chief message conveyed in this paper—our unqualified satisfaction with cancellous iliac bone. During 1945, 117 iliac bone

Fig. 7. X-ray appearance of large malar compound replacement after 6 weeks.

Fig. 8. X-ray appearance of mandible graft, clinically firm at 7 weeks.

grafts have been used in facial and jaw defects operated upon by the plastic and maxillofacial department in this one Army specialty center. They have been used in defects which have undergone every possible complication which would make them poor risk areas. Many were the result of severe lacerations or crushing injuries; others communicated with septic sinuses and oral cavities; some housed foreign bodies and sequestra; in several previous attempts had been made at repair with nonvital substances such as vitallium, acrylic, or preserved cartilage; a few were defects which had been abscessed or involved in an area of osteomyelitis or cellulitis. Former arbitrary waiting periods of, say, 5 months between septic or potentially septic conditions and performance of bone grafts have been ignored. We have merely waited, as a rule, from 3 to 5 weeks after cessation of drainage or subsidence of other signs of sepsis. Penicillin, 25,000 to 50,000 units every 3 hours, has been given routinely for several days postoperatively in all cases except those considered in no way potentially septic. It is granted that this fortification against possible septic complications has encouraged our boldness in proceeding early.

There have been no regrets and no graft has been lost. In 1 instance a small piece of thin cortical bone, which had been left on the graft, separated and had to be removed as a sequestrum. Several patients had local swelling and serosanguineous fluid was aspirated one or

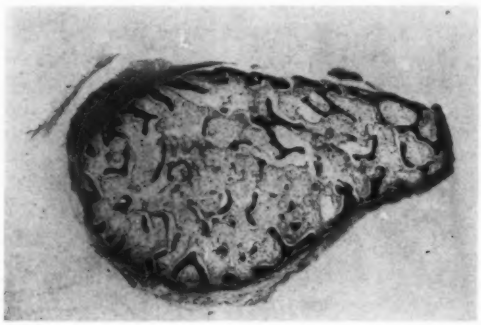


Fig. 9. Low power photomicrograph of hoarded cancellous bone after 8 weeks. No cortex had been included upon the original specimen.

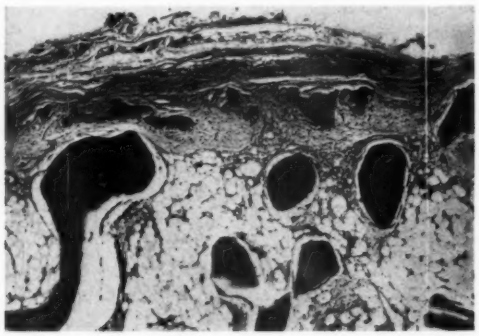


Fig. 10. High power photomicrograph. In this section is shown the new bone and cortex formation at the periphery.

more times from about the bone. Two patients have had cellulitis in overlying skin; with continued penicillin systemically and wet packs locally, it has soon subsided. In no case has the bone graft appeared to be threatened. Union and consolidation occur early and clinical firmness usually is present during and after the third week.

Certain technical considerations which conserve time at the operating table and contribute to uncomplicated healing are worthy of notation: General anesthesia is desirable, if not mandatory, pentothal being used in operations which can be done in approximately an hour and intratracheal gas-oxygen-ether for the longer ones. However, consumption of the anesthetic agent is minimized and gratifying hemostasis attained by injecting both donor and recipient sites with 1 per cent novocain containing 7 to 10 minims of 1:1000 adrenalin per ounce. An incision about 4 inches long parallel to, and just below, the right iliac crest is made to the bone. A wide sharp chisel quickly unroofs the ilium and turns its outer table down like a trap door. The desired amount of bone is removed consisting, if a large amount is taken, of one large block and a few small ones. If the graft is to be large and will require rigidity or strength, as for a jaw, it is well to leave all or part of a thin layer of cortex on one side. Otherwise it may break during its shaping and fixation or early in the convalescence before new bone formation solidifies its structure. An assistant proceeds with closure of the donor area in layers, leaving a Penrose drain for 24 hours. Soft voluminous pressure dressings held in place with wide circumferential stockinette bandages permit a tolerably comfortable postoperative period. Patients state that the "hip was uncomfortable for 7 or 8 days"; most become ambulatory voluntarily at the end of that time. At the recipient site it is commonly possible to excise or reopen an old scar line; otherwise an incision is made favorably situated in the direction of Langer's lines. A pocket is made for the graft, and the bone is freshened at one or more places for contact. Tantalum wire is used for fixation of some of the larger grafts, chiefly those of the mandible and the larger ones in the malar region. In the majority of other depressions—as orbital rim, forehead, or nose—the recipient pocket contains the bone firmly and no special fixation is indicated. After the main block is in place, dead space and contour irregularities are occupied by chips of the residual cancellous material. It is readily broken or cut with stout knife or scissors, then laid or pressed into place until contour and bulk are correct. Simple closure without drainage and soft pressure dressings maintain the bone safely "home." Usually firmness is noticed at the first change of dressings from 3 to 5 days later. At that time, penicillin is withdrawn if there is no evidence of a septic reaction.

There can be no doubt that cancellous bone is rapidly vascularized, probably as rapidly as a free skin graft. Otherwise it would not "take" so dependably in areas badly traumatized and formerly or potentially septic. It is actively osteogenic and rapid new bone formation is grossly indicated by the early firm attachment and substantial feel.

A left-over block of the material was hoarded in a patient's subcutaneous abdominal fat. It was removed for study at the end of 7 weeks. Our pathologist (Major G. D. Ayer, Jr.) described the gross specimen and his comment, in part, upon the microscopic picture is as follows: "Nine sections comprise gross serial cross sections taken in the long axis of the specimen. In most locations there is incomplete formation of cortex beneath the moderately dense connective tissue investment."

On a previous occasion, in the case of the Air Corps officer whose ivory graft for saddle nose was replaced by a cancellous iliac bone graft, a spindle-shaped piece of the material was likewise hoarded. Several months later an x-ray flat plate of the abdominal wall showed the specimen with a dense cortex and less dense medullary core.

SUMMARY

The problem of restoring facial bones functionally and of correcting contour defects cosmetically has been surveyed in a general way. No attempt has been made to describe any one method in exhaustive detail. However, the use of various materials, both inorganic

and organic, homogenous and autogenous, has been discussed entirely from personal observation and experience in an unusually large series of cases. Results from foreign substances have been consistently bad; utilization of homogenous human substance brings in added possibilities of contamination, incompatibility and tissue reaction; autogenous tissue, other than bone, in some cases has been inadequate, undependable, or unpredictable. Cancellous bone has served well, often in areas that had been badly traumatized or septic, with success and gratifying end-results.

Several exemplary cases are mentioned, some with "before and after" pictures illustrating corrections which show no tendency to become distorted, absorbed, or otherwise modified by time. Since the graft is composed of living and established tissue, there is little or no danger of ultimate disappointment.

Gross observation and microscopic study has been made upon hoarded specimens to demonstrate that these grafts become rapidly vascularized, are osteogenic, and develop their own cortex. Their survival does not depend upon bony contact.

CONCLUSIONS

1. For correction of contour defects and bony losses in facial structures, several substances are available. It is my opinion that all of the foreign substances should be abandoned.

2. Homogenous preserved cartilage has its useful place, particularly in replacing lost ear cartilage and in other relatively minor defects where strength or support is not a significant requirement. It should be taken from a proved "clean" donor under aseptic conditions, preserved in antiseptic solution changed occasionally, refrigerated, and cultured every 2 or 3 weeks.

3. Fat is practically useless except as a local attached subcutaneous pedicle for small depressions.

4. Fascia lata is sometimes preferable for shallow depressions and probably serves more safely and dependably than de-epithelialized skin.

5. Iliac cancellous bone is a singularly dependable, utilitarian, safe, and satisfactory tissue for correction of the types of defects that have been discussed.

COMBINED JAW RESECTION NECK DISSECTION FOR METASTATIC CARCINOMA OF CERVICAL LYMPH NODES SECONDARILY INVOLVING THE MANDIBLE

EVERETT D. SUGARBAKER, M.D., F.A.C.S., and JACK GILFORD, M.D.,
Columbia, Missouri

IT is now generally conceded that the preferred treatment of carcinoma in cervical lymph nodes, metastatic from tumors of the oral cavity excepting that derived from the undifferentiated cancers found chiefly in the base of the tongue, tonsil, nasopharynx and extrinsic larynx, is radical surgical removal. Certain contraindications to lymph node dissection will readily be accepted as unequivocal. They are an uncontrolled or uncontrollable primary, distant metastases and such poor general condition of the patient as to impose an operative risk outweighing what can reasonably be expected in survival.

Considerations of a more relative nature have to do with the extent of the disease in the neck; whether it is unilateral or bilateral, whether it is confined to the upper cervical areas only or also involves nodes lower in the cervical chains and whether or not secondary involvement of structures adjacent to the involved nodes by extension of the disease through the node capsules has occurred. The present writing is concerned with extension of this nature into or intimately about the mandible. Our personal experience has been limited to the treatment by combined jaw resection and neck dissection of 12 such cases. The problems presented by them and the results obtained to date would appear to be worth mentioning in view of the scarcity of information available in this regard.

Applying strictly the contraindications of neck dissection as outlined by Duffy, all cases presenting node fixation are to be considered inoperable regardless of where the fixation has occurred. Blair and co-workers have adopted a less conservative attitude toward fixation to the mandible as is indicated by their statement: "A limited attachment of the neck mass to the body of the mandible does not contraindicate dissection if this part of the growth can be isolated from the deeper structures and destroyed with the cooking cautery." Apparently attempts at total surgical extirpation without reliance on the rather uncertain effect of the cooking cautery were among those reviewed by Taylor and Nathanson. Though the number of their cases and the results are not given, they conclude that "the operation is a hazardous one, often not likely to succeed."

Of our 12 patients 2 were females and 10 were males. Their ages ranged from 28 to 83 years. The disease in the lymph nodes had originated from a primary site present in the lip of 9 patients, in the buccal mucosa of 2, and in the tonsil of 1. Four patients presented active disease at the primary tumor site in combination with the metastatic nodes and the mandibular involvement. In 8 cases the primary carcinoma had been previously treated elsewhere with success.

TREATMENT

A very careful appraisal of the general condition of these patients is first made and the co-operation of the dentist is solicited in eliminating oral sepsis. Penicillin administration begun 48 hours preoperatively and continued into the postoperative period has seemed to diminish the severity of the reaction to the operative procedure. Nitrous oxide induction-endotracheal ether anesthesia has been used exclusively, the pharynx being snugly packed with saline moistened

From the Department of Surgery of the Ellis Fischel State Cancer Hospital.

gauze to prevent aspiration of material into the lower air passages. In cases of this kind because of the usually marked extent of disease it is our belief that a radical neck dissection should accompany the resection of the mandible whenever the general condition of the patient will allow, and this will apply to most patients under 60 years of age.

On these occasions the dissection is begun just above the clavicle with division of the sternomastoid muscle and the internal jugular vein. When the level of the external carotid artery is reached, this vessel is ligated in continuity distal to its superior thyroid and laryngeal branch. Pads are placed in the lower part of the wound, and attention is momentarily diverted to the oral cavity. Here the mucosa of the floor of the mouth is incised as far as the subjacent lesion requires, either the scalpel or the endotherm knife being used. On introducing a finger into this incision one finds a ready plane of cleavage between the mylohyoid muscle and the muscles of the tongue. The lingual nerve is appreciated as a band and some care must be exercised to prevent its avulsion. A similar incision is made through the mucosa of the gingivobuccal gutter, and by blunt finger dissection this is easily deepened into the subcutaneous fat of the cheek as far as is indicated, usually to the inferior border of the mandible. Very little bleeding results if the facial veins are not torn. These two incisions are lightly packed with moist gauze. The upper cervical skin flap is next developed superficial to the platysma muscle whereupon communication is established with the lateral mouth plane. All skin attached to the mass is widely sacrificed. At the spot chosen for sectioning the mandible, a Gigli saw is passed around it and the bone is severed. The contents of both submental spaces are dissected to the lateral border of the ipsolateral anterior digastric muscle belly; the portion of mandible to be removed is retracted upward and laterally, and the mylohyoid muscle is cut free of the hyoid bone. Thus the node mass is left entirely undisturbed, bounded superiorly by the mandible, externally by the platysma muscle, and deeply by the mylohyoid muscle. From this point one may proceed to free the mandible from its muscular and ligamentous attachments and to complete the upper posterior portion of the neck dissection in the usual manner. The mucosal edges of the oral cavity wound are apposed by means of a Connell type of stitch reinforced with a row of interrupted sutures. After mucosal closure has been completed the entire neck wound is lavaged with liberal amounts of physiologic saline. Several small Penrose drains are appropriately placed and the wound is closed.

Whenever considerations relative to the patient's physiologic reserve indicate that so extensive a procedure may not be tolerated, attention is paid to the known disease first. The external carotid artery is ligated, the intraoral incisions are developed, the upper skin flap is formed, and coincident removal of the jaw and submaxillary contents is continued. Before the specimen is detached laterally, however, an appraisal of the situation may again be made with completion of the neck dissection from above downward if circumstances latterly seem to warrant it. Though one is naturally desirous of doing wide *en bloc*, dissection of all suspected tissues, the initial accomplishment of a suprahyoid dissection and mandible resection followed at a later date by completion of the neck dissection is entirely feasible and is certainly an occasionally legitimate compromise in poor risk patients. Whenever extensive disease is also present in the primary tumor site, this is widely excised (lip, buccal mucosa or gingiva) in continuity with the jaw and node. It will sometimes be impossible to accomplish an immediate restoration of the part. Resultant defects are left for subsequent repair and anticipation of them should in no way influence the primary consideration, namely wide removal of the tumor mass.

In sectioning the mandible the functional and cosmetic results are directly proportional to the amount of chin which can be spared. When the anterior portion of the mandible must be sacrificed because of tumor fixation bilaterally, the typical "Andy Gump" deformity results. When bilateral submaxillary metastases are present which though firmly attached to the mandible on one side are only moderately fixed over a small area on the

other, it has been our practice to resect the mandible with the nodes on the side of the marked adherence only. On the opposite side several millimeters thickness of the inferior border of the mandible only is removed, the object being to spare the anterior mandible whenever this can be accomplished without undue risk. Detachment of the anterior tongue supports (genioglossus muscles) permits that structure to be drawn posteriorly and downward filling the hypopharynx interfering with the airway, sometimes for a prolonged period. Speech and proper deglutition are permanently impaired. Drooling is very apt to occur. In accomplishing lateral mandibular resections it is therefore important to preserve as much of the anterior jaw as possible. It has been our practice to remove less mandible in the absence of roentgenographic evidence of involvement than when such involvement was demonstrated to be present. Usually the bone is cut 0.5 to 1.0 centimeter anterior to the attachment of the mass when roentgenologic signs of bone destruction are absent. Since the involvement is usually along the inferior border of the mandible we have practiced cutting the mandible obliquely so as to preserve a 1.5 by 2.5 centimeters longer superior than inferior border. If the bone is invaded, however, one has little knowledge of how far extension in the medullary canal may continue, and if the bone involvement is extensive, it seems likely that the safest point for anterior division of the jaw would be through the symphysis. After the mandible is freed of its muscular attachments, it is then customary to disarticulate it. In order to avoid troublesome pericapsular bleeding about the joint the condyloid process may be severed with a rib cutter, however. In the absence of advanced bone invasion this should result in no harm. On the contrary a large fragment of ascending ramus left behind will not only increase the chances of recurrence but will invariably be drawn upward and inward by uncompensated temporal and pterygoid muscle pull and will produce severe discomfort on mastication.

Catgut of suitable size is used throughout except for skin closure which is accomplished with silk or cotton. Buried nonabsorbable suture material, though it does no harm has produced late granulomas which are extremely worrisome to the patient who is usually alert for signs of recurrence.

The actual cautery has not been used in any of the procedures since the need for sealing lymphatics is highly theoretical. Should the lymphatics at the point of transection be permeated by disease, it is highly unlikely that the cautery would be any more effective than the scalpel in preventing recurrence. The cautery presents the disadvantages of so altering the tissues as to interfere with accurate palpation which we consider to be essential to accurate removal, and also interferes with primary healing. Careful local hemostasis aided by preliminary arterial ligation for the rigid maintenance of exposure and careful palpation with wide excision are essential, we believe, if one is to safeguard against transsecting cancerous tissue.

Where trismus is present preoperatively, tracheotomy is done preliminarily and the anesthetic is administered by this route. Excepting such instances, however, the tracheotomy is not done until the resection has been completed and it is then accomplished routinely. The patient is informed before the operation that he will be unable to speak for several days following it and that the tracheal opening will be permitted to close spontaneously when all swelling in his throat has subsided. Tracheotomy tubes require considerable nursing care in keeping them clean and free of mucus. Increasing the humidity of the room by means of a steam kettle will diminish tracheobronchial secretion and crusting of mucus. At least one transfusion, and usually several are administered during the operation. These are given to replace blood lost and as prophylaxis against shock. Accordingly transfusion is begun shortly before or at about the time the skin incision is made. Hot saline mouth irrigations are started on the day after operation to cleanse the intraoral suture line and are repeated at hourly intervals during the day until the mouth is well healed. If the patient evidences no nausea, a small caliber Levine tube is passed into the stomach on the first postoperative day, and tube feedings are begun in small amounts of 100 to 150 cubic

centimeters five or six times daily, increasing the amount each day to meet bodily requirements. At the first complaint of nausea the gastric contents are aspirated, the tube is removed, and the feedings are temporarily discontinued. A patient with a tracheotomy tube is unable to clear his airway with the explosiveness that the functioning glottis permits and therefore all possibility of aspirating food must be strictly avoided. The patient is urged to get out of bed by the third or fourth postoperative day. Prior to that time he generally feels too ill to do so.

CASE 1. No. 4109. Patient a white male, aged 61 years, was admitted May 15, 1942. An unidentified tumor was removed from the mucosa of the right cheek with cautery 8 months before admission. He had had a lesion of the left lower lip treated similarly 7 years previously. For 3 months prior to hospital entry he had noted progressive enlargement of a mass in the right submaxillary space recently productive of constant pain in the jaw.

Examination revealed an old scar on the left vermillion border of the lower lip and another on the right buccal mucosa just posterior to the commissure of the mouth. The entire right submaxillary space was filled with a large mass approximately spherical and solidly fixed to the mandible. The overlying skin was thin, tense, and discolored indicating impending breakdown. There were no other palpably enlarged lymph nodes. An aspiration biopsy specimen was reported epidermoid carcinoma. Roentgenograms of the mandible showed no evidence of bone invasion and those of the chest gave no evidence of metastatic carcinoma.

Accordingly on May 29, 1942, an *en bloc* resection of the right mandible and contents of the right neck (excepting the posterior triangle), was done and the postoperative course was uneventful. The laboratory examination of the specimen revealed involvement of the large submaxillary node only with extension out into the surrounding soft tissues. There was bone invasion in one area and wide periosteal involvement.

A series of subsequent events then occurred in the following order:

August 5, 1942, a recurrence was noted in the soft tissue at the posterior extremity of the upper incision. This was widely excised.

October 16, 1942, two nodules were noted midway down the cervical border of the trapezius muscle. These were excised along with all the skin of the neck and the contents of the posterior triangle and the defect was covered with a large dermatome split thickness graft.

August 23, 1946, no further evidence of disease has been noted to date.

CASE 2. No. 4302. A white male, aged 69 years, was admitted July 9, 1942. Patient stated that a rapidly progressing lesion had been present on the lower lip for only 1 year.

On examination the entire lower lip including both commissures of the mouth, was involved by a fungating mass firmly attached to the mandible. Conglomerate nodes were present in both of the submental and the submaxillary spaces and were also adherent to the mandible. Biopsy revealed an epidermoid carcinoma, grade 1. Roentgenograms revealed no evidence of actual mandibular destruction or pulmonary metastases.

On July 14, 1942, an *en bloc* resection of the lower lip, the anterior portion of the right horizontal ramus of the mandible, and all of the left horizontal ramus of the mandible was combined with a left total neck dissection. On pathological examination a tumor was found growing diffusely in the submaxillary space but none of the jugular nodes was involved. The postoperative course was uncomplicated.

On August 14, 1942, a left supraomohyoid neck dissection was done. Capsular invasion of the involved lymph nodes was noted microscopically with wide periosteal involvement. There was no demonstrable invasion of the jaw. Convalescence occurred without incident.

During follow-up a recurrence was noted adjacent to the anterior end of the left mandible. This was excised January 29, 1943.

Plastic repair of the face defect had been begun August 5, 1942, and was finally completed September 3, 1944; a skin tube swung from the chest wall was used with a satisfactory cosmetic and functional result. The patient remained free of any evidence of disease, but expired rather suddenly at home of pneumonia on April 30, 1945.

CASE 3. No. 5471, white male, aged 76 years, was admitted July 29, 1943. One year before he had had a "cancer" removed from lower lip. A mass had been noted below the left jaw 2 months prior to admission. A small defect was present on the vermillion border of the left side of the lower lip without evidence of residual disease. An ulcerating mass filled the left submaxillary region and was densely adherent to the mandible. There were no other palpably enlarged nodes. A biopsy revealed grade 1 epidermoid cancer. Roentgenograms showed an area of bone destruction along the inferior border of the left horizontal ramus of the mandible. The lungs appeared to contain no metastases.

A resection of the left mandible was combined with a supraomohyoid neck dissection on August 7, 1943. A tracheotomy was not done at the time of resection. However, about 5 hours later the patient developed marked stridor and a tracheotomy was done on the ward. The postoperative course thereafter was uncomplicated.

On examination of the operative specimen, disease was found only in the large ulcerated submaxillary node. The clinically noted bone invasion was confirmed and extensive periosteal involvement was present. The patient remained well until April 14, 1944, at which time a metastatic node was found in

the right (opposite) submaxillary space. It measured 2.5 centimeters in diameter when first seen and was moderately adherent to the inferior border of the right mandible. A supraomohyoid neck dissection was done and at the point of attachment of the node to the mandible several millimeters' thickness of bone was also removed.

The postoperative course was uneventful and the patient remains well 2 years and 6 months later.

CASE 4. No. 5725. A white female, aged 83 years, was admitted to the hospital October 13, 1943. She had developed a lesion at the left corner of the mouth 18 months prior to admission, and had been treated with radium. At the time of treatment to the primary lesion a small lump was already noted in the left submaxillary space. A few x-ray treatments had been given without apparent effect. On admission a scar without evidence of persistent disease was present adjacent to the left commissure of the mouth on the upper lip. The left submaxillary space and upper neck were filled by a large, deeply cratered mass fixed to the mandible and deeper neck structures and measuring 8 centimeters in diameter. The common and internal carotid arteries were palpably free of the mass. There was marked trismus and pain in the jaw. Biopsy of the crater was reported epidermoid cancer, grade 1. A roentgenogram of the chest revealed no metastatic foci in the lungs. Films of the mandible showed erosion of the inferior border of the left horizontal ramus by the tumor. Initial impression was that symptomatic treatment alone was indicated; however, the patient pled so fervently for removal of the tumor that it was finally decided to attempt this.

On October 25, 1943, a resection of the left mandible and node dissection was done. It had been intended to confine the dissection to the upper neck; however, small but grossly involved nodes were noted along the course of the internal jugular vein. The patient had been doing very well up to this point and it was decided to complete the neck dissection with removal of the sternomastoid muscle and internal jugular vein. During this part of the procedure the endotracheal tube slipped above the glottis, and either as a result of cord spasm or laryngeal edema the airway was shut off completely and marked cyanosis was noted. A tracheotomy was hastily done but a sharp though transient drop in blood pressure occurred. The patient never fully regained consciousness and expired about 20 hours after operation. An autopsy (exclusive of a brain examination) failed to reveal any decisive cause of death. Examination of the operative specimen revealed metastatic involvement of the preauricular, submaxillary, and upper jugular lymph nodes.

CASE 5. No. 6689. A white male, aged 36 years, was admitted to the hospital August 23, 1944. He had noted a pea-sized lesion of the vermillion border of the lower lip 2 years prior to admission. This tumor was treated with roentgen therapy 1 year later and rapidly disappeared. A mass was noted in the right submaxillary region 8 months before admission with subsequent marked increase in size. On examination a small scar was noted to the right of the midline of the lower lip without evidence of persistent disease. The right submaxillary space was filled by a mass measuring 6 centimeters in its greatest diameter, solidly fixed to the horizontal ramus of the mandible. The overlying skin was thin, discolored and adherent. No other nodes were palpable. Routine laboratory studies were unremarkable and an x-ray film of the chest failed to reveal any evidence of pulmonary metastases. Roentgenograms of the mandible revealed no architectural changes. An aspiration biopsy of the mass was reported "epidermoid carcinoma." On September 1, 1944, a right radical neck dissection with resection of the right mandible and tracheotomy was performed without untoward event. The pathologist reported epidermoid carcinoma, grade 2, metastatic only to the single large submaxillary node though 77 negative nodes were found in the specimen. There was extensive periosteal involvement. The patient's postoperative course was entirely satisfactory, and he was discharged from the hospital September 17, 1944, his sixteenth postoperative day. He was last seen in follow-up on October 11, 1946, and presented no evidence of recurrent or metastatic disease.

CASE 6. No. 7082. A white male, aged 71 years, was admitted to the hospital December 13, 1944. Approximately 7 months prior to entry he had noted a blister of the lower lip which had progressed rapidly. He received roentgen therapy without apparent effect. Four months before admission a mass had appeared in the left submaxillary area. This had increased in size eventually ulcerating through the skin. On admission the entire lower lip, excepting the base, was involved by an ulcerating mass measuring 7 centimeters in transverse diameter extending into the left buccal commissure. A left submaxillary mass measuring 4 centimeters in diameter was present. This was firmly attached to the mandible and had ulcerated through the overlying skin. No other adenopathy was present. Biopsy specimen revealed epidermoid carcinoma grade 2. X-ray examination revealed no evidence of mandibular destruction or pulmonary metastasis. An excision of the lower lip was carried out on December 19, 1944. On January 15, 1945 a left mandibular resection and a suprahyoid neck dissection were done. Though the procedure presented no unusual difficulty, the patient's blood pressure dropped alarmingly on several occasions requiring rapid administration of blood. As a result of this, pulmonary edema supervened and a large amount of pink froth was suctioned off from the trachea. Rapid digitalization was accomplished and was followed by an uneventful course.

On February 25, 1945 a node was noticed in each subdigastric area, and on aspiration biopsy these were found to contain epidermoid carcinoma. On March 1, 1945, a radical neck dissection was completed on the left. Two weeks later, March 16, 1945, a right radical neck dissection was done. Marked congestion and edema of the head structures lasting

more than a week followed removal of the second internal jugular vein but produced no other untoward effects.

A total of 10 nodes were found to contain disease in the several dissections. None of these was from the lower neck. There was extensive involvement of the periosteum but no invasion of the cortex of the left horizontal ramus of the mandible. The patient is now in the process of having a lower lip constructed, and 19 months following the last dissection remains free from evidence of disease.

CASE 7. No. 6971. A white male, aged 72 years, was admitted November 13, 1944. A lesion of the lower lip had been present no more than 1 year (history felt to be very unreliable). No previous treatment. Examination revealed a bulky foul lesion involving the entire lower lip fixed to the mandible and extending well into the substance of the left cheek. Bilateral extensive submaxillary adenopathy also fixed to the mandible and ulcerated through the skin on the right was present. Pathological diagnosis, epidermoid carcinoma, grade 1. Some erosion of the inferior border of the right horizontal ramus of the mandible was noted on x-ray examination. There was no roentgenologic evidence of pulmonary metastasis. The patient was given a preliminary course of anti-inflammatory x-ray therapy and on December 20, 1944, an *en bloc* removal of the lower lip, a portion of the left cheek and both horizontal mandibular rami was combined with a bilateral suprahyoid neck dissection. The laboratory reported involvement of 9 of 40 nodes found on the right and 4 or 5 found on the left. Node capsular invasion was present generally. A skin tube was begun on the chest wall for eventual repair of the defect, and the patient was discharged from the hospital January 24, 1945. He was readmitted March 14, 1945, with nodes in both jugulodigastric areas.

On March 29, 1945 a total neck dissection was completed on the right with removal of the internal jugular vein. Minimal lobular pneumonitis complicated the postoperative course but responded well to penicillin therapy. Seven of 27 nodes found were involved by metastatic disease. On April 18, 1945, a total left neck dissection was completed without untoward incident. The left internal jugular vein was also removed. Two of thirty-three nodes were involved making the astounding total of twenty-two involved nodes out of a total of 75 found in both sides of the neck.

Apart from marked edema of the conjunctiva, face, tongue and larynx incident to removal of the second jugular, all went well and the patient was discharged from the hospital improving on May 7, 1945, without any further evidence of disease. On May 13, 1945, the patient died suddenly of causes unknown.

CASE 8. No. 7245. A white male, aged 61 years, was admitted to the hospital February 19, 1945. A progressively enlarging ulceration of the left buccal mucosa had been noted for 5 years. No treatment had ever been applied. Six months previous to admission a mass had appeared below the left mandible. At the time of admission a large exophytic lesion of the left buccal mucosa measuring 6 centimeters in diameter was found. It extended from the oral commissure to the angle of the mandible and from the upper to the lower gingiva. It had penetrated the full thickness of the cheek ulcerating through the skin in one area. The left submaxillary space was occupied by a bulky mass 10 centimeters in greatest diameter and fixed to the mandible. Ulceration through the thinned out skin overlying the node mass appeared imminent. There was no other palpable lymphadenopathy in either side of the neck. Biopsy was reported epidermoid carcinoma, grade 1. Roentgenograms revealed erosion of the posterior alveolar aspect of the mandible. There was no evidence of pulmonary metastases.

On February 23, 1945 section of the left cheek and left mandible was combined with a left radical neck dissection. Pathological examination of the specimen revealed a well differentiated epidermoid carcinoma with well marked locally invasive properties which had metastasized rather widely to four cervical nodes, two of these being in the jugular chain. There was no invasion of the mandible noted. The postoperative course was entirely uneventful.

Clinic follow-up was unremarkable until November 11, 1945, at which time a swelling was noted in the left temporozygomatic region and a 2 centimeter mass appeared just beneath the mastoid. Aspiration biopsy specimens from both areas showed epidermoid carcinoma. This recurrence was considered to be beyond the scope of surgical removal and a course of roentgen therapy was instituted. Died May 12, 1946.

CASE 9. No. 7328. A white male, aged 69 years, was admitted to the hospital March 19, 1945.

In 1938 a diagnosis of "cancer of the left tonsil" was made and the patient was given a course of roentgen therapy, with complete disappearance of the tonsillar mass. In 1939 a "lump" appeared superficial to the angle of the left lower jaw. This was treated with x-ray in 1940, with temporary regression. Later increase in size resulted in a second series of roentgen treatments in 1943, followed by no perceptible diminution in size. During the year prior to admission the mass on the mandible had again begun to enlarge. On examination no trace of a primary tumor remained anywhere in the oral cavity or pharynx. Overlying the angle of the left mandible and fixed to it was a rounded mass 4 centimeters in diameter. The adjacent skin was attached to the mass and showed moderate secondary irradiation changes as evidenced by complete epilation, achromia, and loss of elasticity of the skin. There was no other palpable adenopathy present. An aspiration biopsy of the mass revealed "epidermoid carcinoma." Roentgenograms showed erosion of the mandible beneath the tumor. There was no evidence of pulmonary metastases.

On March 3, 1945, the left mandible was resected in conjunction with a left total neck dissection.

Fig. 1. Case 1. Metastases from healed lesion of the right buccal mucosa before combined jaw resection neck dissection and following dermatome graft of the entire one side of the neck for postoperative recurrences. The outline of the left carotid vessels is easily seen.

Careful pathological examination of the specimen failed to reveal any other involved nodes other than that represented by the mass at the crossing of the facial vessels. There was mandibular invasion present. The postoperative course was unremarkable except for poor healing in the area showing irradiation changes with subsequent formation of a small salivary fistula.

The patient has remained well for a period of 18 months and is at present in the process of having the salivary fistula repaired.

CASE 10. No. 7358. A white male, aged 56 years, was admitted to the hospital March 27, 1945.

In January, 1944, a small tumor of the left side of the vermillion border of the lower lip had been treated with radium with good result. In August, 1944 (7 months before admission), "lumps" were first noted in the left submaxillary area. On examination a small scar was present at the site of the original primary growth with no evidence of persistent disease. A large mass was present, filling the entire left upper neck; it was fixed to the horizontal ramus of the mandible, to the deeper structures of the neck in the region of the hyoid bone and had ulcerated through the skin. It measured 8 centimeters in its greatest diameter. There were no other palpably enlarged nodes. Roentgenograms of the mandible revealed no evidence of bone invasion nor did those of the chest show any metastatic involvement. An examination of aspiration biopsy specimen from the mass revealed "epidermoid carcinoma." On April 2, 1945, a resection of the left mandible and left total neck dissection was done. The left wing of the hyoid bone and small musculature in that region were also removed down to the mucosa of the pharynx. Due to unusual vascularity four transfusions were given in the operating room. The patient's condition remained stable until all return through the left internal jugular system had been severed at which time he developed irregular stertorous respirations and a very rapid pulse of very variable strength. A spinal manometer attached to

Fig. 2. Case 8. Showing ulceration of a carcinoma of the buccal mucosa through the skin of the lip with impending ulceration of the nodes through the skin of the neck. The large buccal lesion is seen in the upper right portion of the specimen.

Fig. 3. Cases 11 and 12. Extensive paramandibular metastasis with oral fistulas secondary to carcinoma of the lower lip. The resulting defects are left for subsequent reconstruction accomplished with tube grafts.

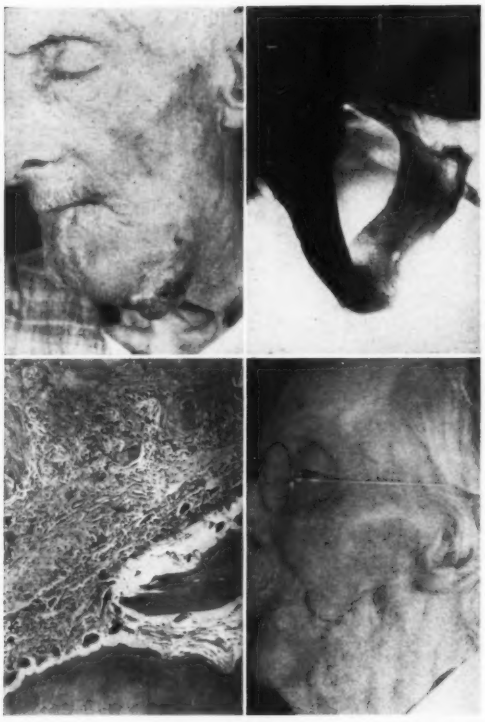


Fig. 4. Case 3. Large submaxillary mass secondary to a small healed carcinoma of the lower lip. Invasion of the mandible is visible on the roentgenogram and the photomicrograph. The necessary wide sacrifice of soft tissue and jaw anteriorly somewhat diminishes the satisfactoriness of the final cosmetic result.

a previously placed needle in the third lumbar interspace (in conjunction with another study) registered a cerebrospinal fluid pressure of 750 millimeters of water which was still rising. After 150 cubic centimeters of spinal fluid had been removed, vital signs promptly returned to normal and the cerebrospinal fluid pressure dropped to 150 millimeters of water. The first two postoperative days were unremarkable and on the third day a Levine tube was inserted for feedings. An absence of a gag reflex was noted during its passage. Vomiting occurred about one-half hour after each feeding and the feedings were discontinued. Aspiration pneumonia supervened, however, and progressed, with death occurring on the seventh postoperative day.

The pathological report on the operative specimen revealed epidermoid cancer present in 2 of 77 nodes found, with a tumor thrombus present in the internal jugular vein. At autopsy extensive necrotizing pneumonitis was found. In addition marked dilatation of the veins overlying the left cerebral hemisphere and numerous thrombi in the left subdural veins were noted.

CASE 11. No. 7493. A white female, aged 38 years, was admitted to the hospital May 11, 1945. She had developed a sore on the lower lip 10 months before admission. She had been treated with "black paste" and the growth disappeared. One month prior to paste treatment and 8 months before admission patient noted nodules in substance of left cheek and below left jaw. On examination a small scarred defect was present on the vermillion border of the left side of the lower lip indicating the site of the original primary tumor. Just lateral to the left commissure of the mouth and extending well into the substance of the left cheek was a hard indurated mass with ulceration through the skin and buccal mucosa producing a through-and-through fistula. The left submaxillary space was filled by a hard mass firmly attached to the mandible with fistulas into the floor of the mouth. In the right submaxillary space was a solitary 2 centimeter node attached to, but slightly movable on, the horizontal ramus of the mandible. The pathological report was, epidermoid carcinoma, ungraded. Roentgen films of the mandible showed no bone destruction and those of the chest were negative for evidence of bone metastasis.

On May 16, 1945 a wide resection of the left cheek and left mandible was combined with a left radical neck dissection. The pathologist reported that there were no involved nodes below the submaxillary group. There was wide periosteal involvement but no demonstrable bone invasion. The postoperative course was unremarkable.

On June 14, 1945, a right radical neck dissection was accomplished with removal of the second internal jugular vein. Only one node of 55 was found to be involved. The patient is now in process of plastic reconstruction and when last seen September 1, 1946, presented no evidence of disease.

CASE 12. No. 1098. A white male, aged 28 years, was admitted to the hospital June 4, 1945. A lesion of right lower lip of 4 years' duration had been treated with roentgen therapy in January, 1944. Eight months later right submaxillary masses developed. On admission patient presented a small scar on the lower lip. The right submaxillary and both submental areas were filled with a foul ulcerated mass fixed to the mandible over a wide area. The disease appeared to be localized to this area inasmuch as there was no other palpable lymphadenopathy and a roentgenogram of the chest showed no metastases. Biopsy specimen was reported epidermoid carcinoma, grade 1.

On June 6, 1945 a resection of the right mandible and considerable surrounding soft tissue was combined with a right radical neck dissection. It was possible to appose the mucosa but not the skin. The large skin defect was covered with a dermatome graft. The graft took well and the postoperative course was progressing satisfactorily until the 10th postoperative day, when the patient (a known epileptic) became very unco-operative, refused all

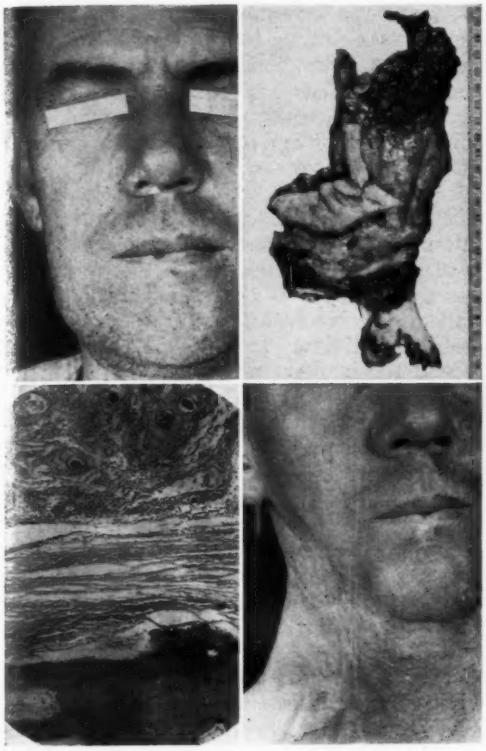


Fig. 5. Case 5. Submaxillary mass (derived from a carcinoma of the lower lip) removed with the overlying attached skin. The markers visible on the specimen are placed for the better orientation of the pathologist. Tumor is visible invading along the periosteum though the mandible itself is not yet involved. The ability to spare the anterior portion of the right mandible considerably improves the cosmetic result.

feedings, removed his dressings, and tore loose the mucosal suture line with his fingers. It became necessary to remove him to a hospital for the mentally ill. Microscopic examination of the specimen showed no other node involvement beyond that presented by the conglomerate mass of disease. There was extensive periosteal invasion but no actual invasion of the mandible was seen. An oral fistula persists, but there has been no evidence of recurrent or metastatic disease 16 months later.

Among the 12 patients operated on there were 2 postoperative deaths. One of these occurred from shock in an 83 year old patient in very poor general condition. The other took place from aspiration pneumonia, subsequent to the regurgitation and bronchial aspiration of tube

Fig. 6. Case 2. Extensive carcinoma of the lower lip with submaxillary and submental node involvement bilaterally; *en bloc* removal of the diseased area with most of the horizontal portion of the mandible; entire defect reconstructed with tube graft brought from upper chest wall.

feedings. Autopsy findings in this patient revealed brain changes, which were considered to be of etiologic significance in the patient's inability to handle his feedings. The patient's operative course would relate these to internal jugular vein resection. Apart from the 2 deaths there were no other serious complications.

Postoperative temperatures have usually ranged from 101 degrees F. to 103 degrees F., for the first 3 to 4 days, probably as a result of the natural contamination of so large a wound. No serious infections ensued though occasional collections of seropurulent material, particularly in the pterygoid region, did require drainage. Significance is attached to the fact that most of the patients treated presented lip cancer. It is unlikely that many cases of cancer of the tongue, floor of the mouth, *et cetera* will be found suitable for such an operation as most of these will present other manifestations of more widespread dis-

ease at the stage of fixation of the local nodes to the mandible. Our one case having had a primary cancer of the tonsil was definitely bizarre in its behavior.

There have been three postoperative recurrences. Only one of these occurred among the patients whose disease derived from a carcinoma of the lip (Case 2). In this instance the probability of recurrence was anticipated, for at one point in the procedure, a small but involved lymph node was inadvertently cut across. The recurrence was carefully sought for during subsequent follow-up examinations, and when it appeared was apparently successfully treated by wide excision. The other two recurrences (Cases 1 and 8) took place presumably on the basis of microscopic permeation of lymphatics at some distance from the palpable limits of the disease in patients whose disease it was felt had been widely circumscribed at operation. Both of these represented carcinomas of the buccal mucosa. It is our belief that these recurrences when they take place in an area still amenable to wide surgical removal should be attacked in that manner even though there may be several. Widespread recurrence would rarely lend itself to surgical extirpation.

In 7 patients the disease was apparently confined to the area of obvious clinical involvement as indicated by careful pathologic examination of the specimen and follow-up examination to date. In the remaining 5 however, either examination of the specimen (where total unilateral dissection was permissible) or the subsequent clinical course (where the dissection because of other considerations was subtotal in extent) revealed occult metastatic disease that had been unsuspected at the time of operation. This should certainly justify the accomplishment of complete node dissections whenever feasible on other counts. As might well be anticipated 3 of the 4 patients who presented simultaneously active disease in both the primary tumor and the lymph node sites fell into the group having more widespread node involvement than was clinically apparent. Carcinoma which within a short interval is present in both its primary and secondary sites is silently declaring its aggressiveness.

An apology for removal of the mandible in those cases failing to show roentgenologic evidence of actual bone invasion hardly seems necessary. That bone invasion will occasionally be microscopically demonstrable in spite of roentgen report to the contrary is well exemplified by Case 1.

In the absence of bone invasion, however, wide periosteal involvement has been the rule in our experience when node masses are fixed to the jaw. It is doubtful whether anything less than resection of the mandible is justified under such circumstances.

The duration of follow-up in these patients is still too inadequate to draw any definite conclusions as to actual long term survival. Of the 10 patients surviving operation, 2 have died of intercurrent disease 27 months and 1 month, respectively, from the date last treated and at the time of death were free of any evidence of carcinoma. One died with a recurrence treated by x-ray which developed 7 months following operation. Seven are living and free of any manifestation of recurrent or metastatic cancer by actual examination 45, 30, 25, 19, 18, 16, 16 months, respectively. Certain statements regarding the group surviving free of disease are justified, however, since it will be readily admitted that what life remains for these patients untreated is pitiful in the extreme. Radiation therapy at this stage of the process accomplishes little palliatively, and cures must be very rare; operative treatment can be accomplished with an acceptable mortality. The survival of 7 patients to date has unquestionably justified the effort. Since carcinomas of the type here discussed as a rule give evidence of recurrence or metastasis within 1 year of treatment, there is reason to expect that a fair percentage of those surviving to date free of disease may continue to do so.

SUMMARY

1. Twelve patients are presented in whom a combined jaw resection and neck dissection were carried out for carcinoma metastatic to the upper cervical lymph nodes which secondarily involved the mandible.

2. A natural selection of such cases is indicated by the tendency which some tumors have for prolonged local aggressiveness before

dissemination beyond the limits of surgical removal occurs.

3. Considerations relative to the management of these patients are discussed.

4. The results to date, 2 postoperative deaths, 1 patient died with recurrence, 2 deaths from intercurrent disease without recurrence and 7 patients alive without recurrence from 16 to 45 months after the treatment, suggest an ultimate prognosis far different from the relatively hopeless outlook formerly existing for these patients.

REFERENCES

1. BLAIR, V. P., MOORE, S., and BYARS, L. T. Cancer of the Face and Mouth. P. 327. St. Louis: C. V. Mosby Co., 1941.
2. DUFFY, J. J. Surg. Gyn. Obst., 1940, 71: 664-671.
3. TAYLOR, G. W., and NATHANSON, I. T. Lymph Node Metastasis. P. 399-404. London, New York, Toronto: Oxford University Press, 1942.

THE MANAGEMENT OF PLACENTA PREVIA AT THE CHICAGO LYING-IN HOSPITAL

A Review of 325 Cases during 1931 to 1945

M. EDWARD DAVIS, M.D., F.A.C.S., and ALICE CAMPBELL, M.D., Chicago, Illinois

PLACENTA previa is still one of the major complications of pregnancy and labor but modern management has robbed it of much of the terror of past decades. Early diagnosis, hospitalization, rational obstetrical treatment and the ease of blood and plasma transfusions have decreased the mortality to the vanishing point in our large institutions. However, mortality statistics from the country at large assign 23 per cent of maternal deaths to hemorrhage and at least half of these deaths are due to placenta previa. Many other women who have placenta previa succumb from infection or embolism and find their way into our statistics as puerperal infection deaths. Thus, it is a fair estimate that 15 to 20 per cent of our maternal deaths are the result of placenta previa.

ETIOLOGY

The cause of placenta previa is still unknown. The most plausible theory is that the abnormal implantation probably results from a failure in the mechanism of transportation of the fertilized ovum. Normally, fertilization occurs in the fallopian tube. The fertilized ovum is moved into the uterine cavity at the end of 72 hours but remains free and unattached for the next 4 or 5 days. Normally, the small vesicle remains high in the uterine cavity where it ultimately attaches itself to the endometrium. If environmental forces move the small vesicle downward so that it finally attaches itself in the region of the internal os, placenta previa must result. Many factors may operate to transport the ovum to this abnormal location.

Morton has called attention to the increased decidual response in the region of the internal os in a patient with placenta previa. It is suggested that this marked decidual development in contrast to the meager response high in the corpus may have predisposed to the abnormal placental site.

The fertilized ovum is at no time a free agent but depends on environmental forces to move it down the tube and into the uterus. It cannot select the ideal implantation site but it must attach itself to that location where it finds itself at the time of implantation. This locality may be the abdomen, the fallopian tube, the uppermost portion of the anterior or posterior walls of the uterus or in the region of the internal os. Placentation occurs at the site of attachment. The degree of previa will depend on how close to the internal os the implantation occurs. Abnormal uterine motility, multiparity, decidual development may pre-

From the Department of Obstetrics and Gynecology, the University of Chicago and the Chicago Lying-in Hospital.

TABLE I.—INCIDENCE OF PLACENTA PREVIA
1931 TO 1945

Degree of Previa	Complete	Partial	Incomplete		Total
			Marginal	Low lying	
No.	88	43	121	73	325
Per cent	27.1	13.2	37.2	22.5	100
No placenta palpable on first examination	6	2	15	10	33
Average age	30.3	28.9	28.9	29.7	

Total deliveries, 40,961
Placenta previa, 325
Incidence, 0.79 per cent

TABLE II.—PARITY OF PLACENTA PREVIA
1931 TO 1945

	Complete	Partial	Incomplete		Total	Per cent
			Marginal	Low lying		
Gravida I	14	13	36	19	82	25.2
II	21	12	32	19	84	25.9
III	17	7	18	13	55	16.9
IV	13	2	8	11	34	10.5
V	8	2	12	4	26	8.0
over V	15	7	15	7	44	13.5
Total	88	43	121	73	325	100.0

	Primigravida		Multigravida	
	No.	Per cent	No.	Per cent
Total deliveries	18,619	45.5	22,342	54.5
Placenta previa	82	25.0	243	75.0

dispose to placenta previa only as they may influence the movement of the ovum in the uterine cavity.

The surface area of the placenta may favor a low implantation. In placenta membranacea placental tissue covers most of the chorion as a result of a failure of villi underneath the decidua capsularis to atrophy. Obviously, all or a portion of the internal os will be covered by placenta. Succenturiate lobes may cover a part or all of the os. Lastly, an abnormally large placenta may impinge on the lower uterine segment simply because of its size.

INCIDENCE

The incidence of placenta previa varies in different institutions, from 0.63 to 2 per cent. In a period of over 14 years, May, 1931 to July 1, 1945, 40,961 patients were delivered in the new Chicago Lying-in Hospital and placenta previa was present 325 times, an incidence of 1 in 126 deliveries or 0.79 per cent (Table I). During this period more than 80 per cent of all deliveries in Chicago occurred in hospitals so that the figure represents a fair index of the frequency of this complication. Furthermore, all patients who had bleeding during the last trimester of pregnancy were examined, thereby establishing a diagnosis ac-

The older literature emphasized the fact that placenta previa was a complication of multiparity. The preponderance of large families in these statistics accentuated this idea. The large family is becoming more and more rare and the "grande multipara" is disappearing. However, in Table II, it can be noted that although the deliveries were almost equally divided between primigravidas (45.5%) and multigravidas (54.5%) 3 out of 4 patients with placenta previa were multigravidas. The distribution of the patients in relation to their parity is indicated in Table II. Childbearing predisposes to the development of placenta previa but the reason for this fact is still obscure.

PATHOLOGY

The abnormal location of the placenta results in a pathologic placental uterine relationship which is responsible for the hemorrhage and the greater vulnerability to trauma and infection. When the placenta is high up in the corpus the placental site develops in the thick myometrium of this region. The vascularization incidental to these changes does not interfere with the integrity of the uterus. A thick decidual buffer zone between the placenta and the uterine wall facilitates the physiologic separation in the third stage of labor. Placental attachment is not disturbed by the uterine motility associated with the development of the lower uterine segment in late pregnancy and dilatation of the cervix in labor.

The lower uterine segment and the cervical region are not adapted to placental attachment. This portion of the uterus is the inactive passage zone between the contractile

TABLE III.—ONSET OF BLEEDING IN PLACENTA PREVIA 1931 TO 1945

Gestation Weeks	Complete	Partial	Incomplete		Total	Per cent
			Marginal	Low lying		
Less than 28	13	9	12	5	39	12
28–30	8	6	4	5	23	16
30–32	9	2	11	8	30	
32–34	13	5	13	8	39	35
34–36	10	2	15	7	34	
36–38	12	5	16	7	40	37
38–40	17	8	22	20	67	
40–42	5	4	25	10	44	
42–44	1	2	3	3	9	
Total	88	43	121	73	325	100
Average	31.9	31.9	33.9	33.7	32.6	

TABLE IV.—AMOUNT OF BLEEDING IN PLACENTA PREVIA 1931 TO 1945

	Complete	Partial	Incomplete		Total
			Marginal	Low lying	
None (elective cesarean section)	11	1	6	4	22
Profuse	10	4	15	6	35
In shock	2	2	2	2	8

Elective laparotrachelotomies for other indications than placenta previa

Contracted pelvis	8
Previous laparotrachelotomies	6
Toxemia	4
Medical	4
Total	22

corpus above and the vagina below. The walls composed largely of elastic tissue fibers and few muscle cells are designed to withstand considerable distension and stretching. The vascularization of these walls brought about by placental attachment interferes with their normal integrity. Minor manipulations through the cervix may result in extensive lacerations of the pathologic lower uterine segment. The physiologic changes incidental to effacement and dilatation must necessarily interfere with the attachment of the placenta resulting in minute or more extensive separations which are responsible for the painless bleeding characteristic of placenta previa. In that effacement is a process which may extend over a period of days or several months, episodes of bleeding will recur. The initial hemorrhage may occur early in the last trimester or it may be postponed until the onset of labor but bleeding is inevitable in placenta previa.

The proximity of the placental site to the vagina which always harbors organisms and to manipulations necessary for delivery increases the hazard of infection. Trauma, too, invites infection. The loss of blood favors its development. It has been pointed out that fewer women die of blood loss primarily today but the incidence of infection has not been reduced greatly. There is a greater hazard of thrombosis and embolism in placenta previa. The thrombi in the sinuses of the placental site located in the lower uterine segment are more easily mobilized. The closer association of the placental site and sources of infection favors thrombophlebitis and embolism.

SYMPTOMS

Painless bleeding in the later weeks of pregnancy is pathognomonic of placenta previa. The initial hemorrhage may occur early in the gestation and undoubtedly some abortions are the result of low implantations. These patients never find their way into the statistics on placenta previa. In 39, or 12 per cent, of our patients the initial bleeding occurred prior to 28 weeks, in 53, or 16 per cent, sometime between the twenty-eighth and thirty-second week (Table III). Thus, in 28 per cent of the patients the presence of the placenta in the region of the cervix manifested itself prior to fetal viability. This fact accounts for the high fetal mortality for few babies survive prior to 28 weeks and not many more prior to 32 weeks' gestation. The degree of encroachment of the placenta on the internal os is not the most important factor in determining the time of onset of bleeding. It is apparent from our figures that the bleeding in complete placenta previa began a week or two earlier than in incomplete placenta previa. Marginal or low insertion of the placenta may not result in any bleeding prior to the onset of labor. The onset of efface-

ment of the cervix as well as the uterine motility which is responsible for it rather than the degree of placental coverage of the internal os determines the onset of bleeding.

The severity of the hemorrhage will be determined by the extent of the previa and whether or not the patient is in labor. The initial bleeding is rarely alarming and may subside quickly. It may consist of a few drops or the blood may gush out for a moment. In that the bleeding is dependent on a tear through maternal sinuses by minute separations, the size of the vessel will determine the blood loss. The initial bleeding usually subsides quickly in the patient not in labor, but bleeding will recur in days or weeks. A small amount of bleeding may persist for days to give way to a dark serosanguineous discharge. The onset of labor brings on rapid cervical effacement and dilatation and the hemorrhage becomes more profuse or if it has subsided it will recur. Again, the hemorrhage may be moderate or profuse depending on the rapidity and the extent of placental separation.

In Table IV, it will be noted that 35 patients had a profuse hemorrhage prior to their examination and treatment. Eight more patients were in shock when they entered the hospital. Thus, in 13 per cent or in 1 out of 8 patients the blood loss was serious prior to the institution of treatment. In 22 elective cesarean sections that were performed for indications other than placenta previa, the placenta was encountered in the lower uterine segment covering part or all of the os. In these patients the abnormal location of the placenta incited no bleeding. It is probable that had labor intervened prior to the operation, bleeding would have occurred incidental to effacement and dilatation.

DIAGNOSIS

The diagnosis of placenta previa must rest to a large extent on its pathognomic symptom-painless bleeding in the last trimester of pregnancy. This warning hemorrhage, small or considerable in amount, must invariably call attention to the likely presence of the placenta in an abnormal location. Every patient who complains of bleeding is referred to the hospital for a diagnosis as to the cause. After it has been made certain that blood is available readily in the event transfusion should be indicated, the patient is examined vaginally.

If the cervix is partially effaced and the os admits the finger there is no difficulty in palpating the placenta when it covers part or all of the os. In the low lying placenta the edge can be palpated easily if it reaches within several centimeters of the internal os. In the absence of the placenta the thin membranes are the only barrier between the palpating finger and the presenting part. No anesthesia is necessary for this simple examination. An antiseptic lubricant, such as merthiolate in glycerin, may add to the ease with which the examination is carried out and to its safety.

Abdominal examination may reveal a transverse presentation or the presenting part above the inlet of the pelvis. The presence of the placenta in the lower uterine segment may interfere with the normal accommodation of the head in the pelvis, particularly if the latter is small or abnormal. The abnormal presentation and the failure of engagement of the presenting part is additional evidence of placenta previa in the patient with painless bleeding.

Direct or indirect visualization of the placenta has been used in the diagnosis of placenta previa. Snow and Rosensohn, Brown and Dippel have described a method of filming the uterus to emphasize the variable densities of the soft tissues. If the placenta is ideally located its shadow can be visualized clearly on the x-ray plate in 3 out of 4 patients. The absence of a placental shadow does not rule out placenta previa. Ude, Weum, and Urner have injected radiopaque substances into the bladder and Prentiss and Tucker have used air to provide greater contrasts and the placenta has been visualized as an intervening shadow between the bladder and the presenting part. Both of these methods have been used experimentally at the Chicago Lying-in Hospital, but they have not become a part of our routine because they do not add appreciably to the management of this complication. Pelvic examination affords the opportunity to determine the degree of placenta previa, the state of the cervix, the adequacy of the pelvis and the fetal position. These findings are necessary in a decision as to the appropriate treatment.

In the differential diagnosis of placenta previa all causes of bleeding in the last trimester of pregnancy must be ruled out. We have kept a record for a 5 year period of all vaginal examinations for bleeding during the last 3 months of pregnancy and found placenta previa in 32 per cent of the cases. Many causes, most of them trivial, were responsible for the bleeding in the other patients. The bleeding in abruptio placentae is most often associated with pain but mild degrees of placental separation can occur in the absence of pain and marked uterine tenderness. Painless bleeding can occur from an abnormal cervix, the site of an erosion, a polyp, or, rarely, a malignant lesion. Vaginal varices may rupture and bleed. Trauma of the vaginal walls physiologically altered or inflamed as a result of a lower genital tract infection may result in bleeding. At times the painless bleeding may have its origin in the urethra and bladder or even the rectum. A careful vaginal examination combined with the visualization of the vagina and cervix by means of a speculum will identify the origin of the bleeding most often. Rarely, no cause for the bleeding can be found or the examination is inadequate to rule out placenta previa. In 33 patients no placental tissue could be palpated at the initial examination. However, when they returned to the hospital because of a recurrence of painless bleeding, sufficient changes had taken place in the cervix so that placenta could be palpated.

There are various degrees of previa depending on the extent that the os is covered by placenta at the time of the examination. Complete placenta previa is used to designate complete coverage of the os and incomplete placenta previa partial coverage. At times no placenta is palpable directly over the internal os but it extends into the zone of effacement and dilatation. As the lower uterine segment develops during the latter part of pregnancy and in labor, the dependent portion of the placenta may become separated and cause bleeding. These low insertions of the placenta must be considered as borderline placenta previas. Obviously, the relationship of the placenta and the internal os may vary as effacement and dilatation progress but clinically this classification will suffice. The term, central placenta previa, which denotes that the os is covered by the central portion of the placenta, is no longer applicable for this diagnosis can be made only at cesarean section. Total coverage of the os by placenta at or near complete dilatation is encountered rarely on the large maternity services.

TREATMENT

The treatment of placenta previa has become standardized in the large institutions in recent years. Advances in medicine and in obstetrics have contributed to the present management. No one questions the fact that all patients who bleed in the last trimester of pregnancy should be sent to a hospital for diagnosis and treatment. There is no home treatment for this serious complication.

The treatment of an obstetrical complication identified with blood loss begins in the prenatal period. Each patient should have a careful blood study which should include the determination of the hemoglobin content, the cell volume, Rh reaction, and the Wassermann or Kahn. The patient in whom the hemoglobin remains under 10 grams in spite of iron therapy should be transfused before she goes into labor or suitable blood should be available readily. One cannot always guard against an excessive blood loss but facilities should be at hand for the restoration of blood with a minimum of time loss. Plasma should be available at all times but the armed services have emphasized recently what we have known for a long time that plasma does not replace whole blood in serious hemorrhage.

When blood has been made available and preparations for delivery are complete the patient should be examined vaginally. The state of the cervix should be determined, the presence of placenta over the os and the extent of coverage noted. If the os is free of placenta the adjacent walls of the lower uterine segment should be carefully explored for a low lying placenta. Position can now be determined. Lastly, one should evaluate the state of the soft parts and the size of the pelvis.

If no placenta is palpable, a speculum examination of the cervix may help to rule out the cause of the bleeding. In the absence of

TABLE V.—INITIAL MANAGEMENT FOR CONTROL OF BLEEDING IN PLACENTA PREVIA 1931 TO 1945

	Complete	Partial	Incomplete Marginal	Low lying	Totals
In labor, bag of waters ruptured	0	1	12	9	22
Artificial rupture of bag of waters	8(1F)*	6	33	27	74(1F)*
Ruptured bag of waters, bag	7(1F)*	7	17	9	40(1F)*
Ruptured bag of waters, bag, pituitrin	1	2	4	1	8
Ruptured bag of waters, pituitrin	2	2(1F)*	12(1F)*	6(3F)*	22(5F)*
Ruptured bag of waters, Willett's	0	3(1F)*	7	4	14(1F)*
Ruptured bag of waters, version	4(1F)*	8	1	2(1F)*	15(2F)*
Laparotrachelotomy	63	13	31	14	121
Porro	8	1	3	3	15

*F

TABLE VI.—TERMINATION OF LABOR IN PLACENTA PREVIA 1931 TO 1945

	Complete	Partial	Incomplete		Totals	
			Marginal	Low lying	No.	Per cent
Natural	1	13	41	38	93	28.6
Forceps	0	4	24	7	35	27.4
Extraction	6	5	9	3	23	
Version+extraction	4	6	10	4	24	
Craniotomy	3	1	2	1	7	
Laparotrachelotomy	66	13	31	16	126	44.0
Porro	8	1	4	4	17	
Total	88	43	121	73	325	

placenta previa the patient may be sent home for the examination is unlikely to start labor prematurely.

The initial management of placenta previa is directed toward the control of further bleeding and the delivery of the patient by the most conservative procedure consistent with her safety. When a diagnosis of placenta previa has been established the termination of the pregnancy is indicated. It is recognized that in many patients the baby has not reached a period of development when it can survive out of the uterus. However, the continuation of the pregnancy is fraught with danger and has resulted in an increased hazard for the mother. The primary risk of hemorrhage can be combatted these days by keeping the patient in a hospital where blood is available readily. However, the increased hazard of infection in the presence of vaginal bleeding is still difficult to overcome. It is possible that the use of the new antibiotics prophylactically may some day alter our present routine that once placenta previa is diagnosed the patient should be delivered but that day has not arrived.

The initial management of our patients is summarized in Table V. In a very small number, 22 patients, or 7 per cent of the total, labor was in progress when they were admitted to the hospital. Almost 93 per cent were not in labor but entered the hospital because of bleeding. All of our patients are cautioned about the importance of bleeding in pregnancy so that they are seen at the first warning bleeding. Rupture of the membranes sufficed to control bleeding in 98 instances although all but 8 of these patients had incomplete placenta previa. In 99 other cases some additional procedure had to be instituted. Again, in only 14 of these patients complete placenta previa was diagnosed. Thus, rupture of the membranes alone or combined with some other procedure was the initial treatment for the control of bleeding and the institution of labor in 197 patients or 60.6 per cent of this entire series. Cesarean section was the initial treatment in the remainder.

Complete placenta previa is treated by cesarean section. This method offers the best prognosis for the baby as well as for the mother. Abdominal delivery is indicated in incomplete placenta previa when there has been a serious blood loss; when the cervix is long and uneffaced, unripe so to speak; in the elderly primipara in whom the fetus is of great importance because the mother is near the end of her reproductive period; in the patient with a borderline or grossly inadequate pelvis.

At the Chicago Lying-in hospital the low or cervical cesarean section, laparotrachelotomy, is the operation of choice. It has been suggested that the classic operation would miss

the placenta in the lower uterine segment. There is an increased loss of blood if one encounters the placenta on the anterior wall in the lower uterine segment operation but average care, speed and dexterity will keep the blood loss at a minimum. Furthermore, bleeding from placental sinuses can be readily controlled by direct suture, thereby minimizing the possibility of continued bleeding. The entire placental site on the posterior as well as the anterior wall can be inspected easily and bleeding controlled by pack or suture if necessary.

Incomplete placenta previa can be managed in such a way that delivery can be completed through the birth passages in most instances. If the cervix is partially effaced and the os patulous the membranes are ruptured. This simple device will control bleeding in the majority of the patients by allowing the placenta to remain attached to the lower segment as retraction progresses. The presenting part may descend with the escape of the liquor amnii so that it more closely approximates the placenta exerting pressure upon it and helping to check bleeding. Lastly, the rupture of the membranes in a patient with a ripe cervix is the most effective method of inducing labor.

If simple rupture of the membranes does not suffice to control bleeding in incomplete placenta previa, the use of Willett's method can be considered. Scalp traction is effective for the control of bleeding. Willett's forceps or two teneculae properly applied to the scalp will not result in serious trauma. The viable fetus will usually survive and the scalp damage can be treated. Traction should be applied to the forceps by some contrivance and the least amount of pull necessary to control the bleeding should be exerted. Usually ½ to 1 pound weight over a pulley will suffice.

Cesarean-hysterectomy has been reserved for patients admitted to the hospital potentially or obviously infected, in whom the termination of reproduction is no great loss. The removal of the uterus decreases the hazard of serious infection, for this organ can serve as the focus of a puerperal infection. Extraperitoneal operations, such as the Water's procedure, are of questionable value in these patients because the abnormal location of the placenta leads to increased vascularity of the lower uterine segment and bladder. This would increase the difficulty for the approach to the baby is through this vascularized zone. There may be some other indication for hysterectomy such as neoplasms of the uterus. The operation is not difficult and with care the blood loss can be controlled. Recovery is usually uneventful.

Table VI presents a summary of the modes of delivery in our group of patients. Abdominal delivery was carried out in 143 or 44 per cent of the patients. Ninety-three patients delivered naturally and in 89 some operative procedure was necessary to terminate the delivery through the natural passages. Thus, more than half of the patients were delivered from below without mortality. This fact emphasizes the importance of individualizing the treatment of this complication.

Some of the accepted methods of treatment in placenta previa made honorable by tradition have no place in the modern hospital. They represented the best that were available in their day but progress has made them obsolete. They still appear in the standard textbooks of our time to confuse the student and practitioner.

Tamponade has no place in the treatment of placenta previa. Even as a temporary expedient to check hemorrhage it is ineffective and dangerous. Patients with placenta previa who are not examined are not likely to bleed to death. Thus, the patient who has bleeding in the later weeks of pregnancy should be referred to a hospital promptly. All examinations should be postponed until everything is in readiness to cope with any emergency.

The bag or colpeurynter can be discarded in the management of placenta previa. It provided a means of controlling hemorrhage but the manipulation incidental to the introduction of the bag and the subsequent delivery often resulted in trauma, infection, thrombosis and embolism.

The introduction of a foreign body in close proximity to the placental site increases the hazard of serious infection. Properly placed, bleeding will be controlled but labor must be initiated and hours may lapse before there is

TABLE VII.—THIRD STAGE OF LABOR IN PLACENTA PREVIA 1931 TO 1945

	Complete	Partial	Incomplete		Totals
			Marginal	Low lying	
Laparotrachelotomy	74	14	35	20	143
Natural	9	18	67	49	143
Manual removal	5	11	17	3	36
Uterine pack	2	3	6	4	15
Postpartum hysterectomy	0	2	1	2	5

TABLE VIII.—SUPPORTIVE TREATMENT IN PLACENTA PREVIA 1931 TO 1945

Antepartum and intrapartum	Complete	Partial	Incomplete		Total
			Marginal	Low lying	
Subcutaneous fluids	4	4	3	0	11
Intravenous fluids	5	6	4	4	19
1 transfusion	17	5	6	7	35
2 or more transfusions	1	1	2	1	5
Postpartum					
Subcutaneous fluids	19	7	22	11	59
Intravenous fluids	17	7	13	9	46
1 transfusion	32	17	21	13	83
2 or more transfusions	4	6	4	2	16

sufficient dilatation for the bag to pass through the cervix. The mechanism of labor may be abnormal because the period of the gestation is not favorable to the artificial termination of the pregnancy through the natural passages. Once the bag is in the vagina it must be removed promptly for it no longer acts as a tampon against the placenta. It actually plugs the vagina and much blood can accumulate behind it without the attendant being aware of the continued hemorrhage. When the bag has been removed spontaneous delivery of the child rarely follows. The accoucheur must deliver the baby by version and extraction or forceps. All of these manipulations carried out through a pathologic lower uterine segment, highly vascularized and easily traumatized must result necessarily in serious damage and infection. These factors contribute to increased morbidity and mortality in use of the bag for placenta previa.

Braxton Hick's version was a means of controlling hemorrhage at a sacrifice of the fetus. It was an expedient that had to be resorted to when other methods were less safe. There are several reasons why this method of controlling hemorrhage is hazardous. Braxton Hicks' version was the method of choice in the patient prior to or at the borderline of viability. Under such circumstances the cervix was usually long and at best partially effaced, dilated sufficiently to admit two fingers. The version is difficult under these circumstances even though the accoucheur has had considerable experience. Manipulations result in trauma to the placental area and increased likelihood of infection. Blood loss may be considerable during the process.

The version completed and bleeding brought under control heralds the onset of an indefinite period during which labor must be initiated and complete dilatation secured. In this period of pregnancy the uterus may be unresponsive and uterine contractions desultory. Hours may elapse before the patient can be delivered during which time trauma and infection are real dangers. The delivery of the fetus may be followed by an abnormal placental stage.

It is apparent that the period of pregnancy best suited for delivery by Braxton Hicks' version is the least favorable for a delivery from below. The unripe cervix, the pathologic lower uterine segment, and the uncoordinated uterine motility may all combine to make the delivery of even a small fetus a virtual nightmare. The highly vascularized cervix may tear like wet blotting paper. Infection may be difficult or impossible to control. Many obstetricians have hesitated to do a cesarean section in the patient with placenta previa in whom the fetus is of questionable viability. The decision concerning the mode of delivery should rest on the degree of placenta previa, the state of the cervix, the parity of the patient and the adequacy of the pelvis. If the baby is sufficiently mature to survive so much the better but its fate is of secondary importance. However, the number of premature babies who will survive delivery will be greater by cesarean section than by other methods.

THE PLACENTAL STAGE

The third stage of labor following delivery through the birth canal deserves special consideration. The abnormal location of the placenta may lead to incomplete separation and to continued bleeding from sinuses in the lower uterine segment or from trauma. There are too few muscle cells in the lower segment to produce normal contraction and retraction of the placental site, thereby interfering with placental separation. The same lack of musculature may prevent the normal closure of uterine sinuses. The proximity of the placental site to the vagina and sources of infection increases the hazard from this source.

The phase of placental separation can be expedited by the administration of ergonovine intravenously as the baby is being delivered. At least thirty seconds should elapse from the time the drug is injected until the baby is delivered in order that the ergonovine can exhibit its action. Usually the placenta separates promptly with the passage of the infant out of the uterus and it should be expressed. If separation is delayed in the presence of bleeding the placenta should be removed manually. Invasion of the uterus is not without risk but if carried out with proper regard to asepsis it is far less dangerous than continued blood loss. Continued bleeding after the placenta is out of the uterus calls for a careful exploration of the uterine cavity for a retained fragment of placenta as well as an examination of the lower uterine segment and vagina for trauma. Lacerations which bleed should be sutured. Bleeding from the placental site may have to be controlled by a uterine pack. Tamponade should begin in the corporeal cavity, extending into the lower uterine segment and include the vagina.

It will be noted in Table VII that manual removal of the placenta was indicated in 36 instances. Uterine tamponade to control continued bleeding was necessary in 15 patients. Neither method sufficed in 5 patients for they continued to bleed and hysterectomy had to be performed. This major procedure can be life-saving if the delay is not too great. The patient who continues to bleed in spite of a well placed uterine and vaginal pack and the patient in whom bleeding from trauma cannot be controlled by suture should have adequate replacement of blood and an immediate hysterectomy.

TABLE IX.—MORBIDITY IN PLACENTA PREVIA
1931 TO 1945

Morbidity (22.1 per cent)	Complete	Partial	Incomplete Marginal	Low lying	Total
Endometritis	12	2	7	4	25
Thrombophlebitis	3	4	10	2	19
Wound infection	3	0	2	0	5
Septopyemia	0	1	0	0	1
Cystopyelitis	2	2	2	1	7
Ligation of ureter	0	1	0	0	1
Upper respiratory	0	0	2	0	2
Cellulitis of breast	0	0	0	1	1
Transfusion reaction	1	0	4	0	5
Cause undetermined	1	0	5	0	6
Total	22	10	32	8	72
Mortality (0.6 per cent) Hemorrhage	1	0	0	0	
Thrombophlebitis and pulmonary infarction	0	0	1	0	2

SUPPORTIVE TREATMENT

The ready availability of blood and plasma has been the most important contributory factor in the great improvement in the prognosis of placenta previa. The ability to replace blood loss promptly has influenced our therapy of all obstetrical complications associated with hemorrhage. Every maternity must have available a source of blood for the time factor in the replacement of blood is of the utmost importance. Plasma will maintain the circulation for a short period but blood or red cells are necessary for the patient who has had an exsanguinating hemorrhage. In Table VIII it will be noted that 139 patients or 40.3 per cent of all patients with placenta previa received at least one transfusion and that 21 patients had two or more transfusions.

The hospital that has a blood bank is in an ideal position to provide ample amounts of blood readily. The smaller maternity should have facilities for the typing and matching of patients and donors at all times. A list of donors among the personnel, particularly those in blood group O should be posted in the

TABLE X.—FATE OF INFANTS IN PLACENTA PREVIA 1931 TO 1945

	Birth weight Grams	Total	Still-births	Live births	Died in hospital	Survival of live births
Complete	2500+	43	2	41	1	40
	1000–2500	38	5	33	14	19
	−1000	10	5	5	5	0
Incomplete Partial	2500+	24	1	23	1	22
	1000–2500	13	7	6	4	2
	−1000	7	6	1	1	0
Marginal	2500+	70	6	64	7	57
	1000–2500	43	6	37	11	26
	−1000	9	7	2	1	1
Low lying	2500+	44	0	44	1	43
	1000–2500	25	6	19	4	15
	−1000	3	1	2	2	0
Total		329	52	277	52	225
Per cent			15.8	84.2	15.8	68.4

TABLE XI.—SUMMARY OF INFANTS IN PLACENTA PREVIA 1931 TO 1945

Weight in grams	Over 2500 grams	1000-2500 grams	Under 1000 grams	Total	
				No.	Per cent
No. babies	181	119	29	329	
No. still births	9	24	19	52	15.8
No. live births	172	95	10	277	84.2
No. died in hospital	10	33	9	52	
Survival of live births No.	162	62	1	225	
Per cent	94.2	65.3	10.0		81.2
Per cent of total births	89.5	52.1	3.4		68.4

Total deaths, 104, 31.6 per cent of all births
Twins, 4 pairs (3 premature)
Congenital anomalies (major) 14, 4.3 per cent
Autopsies 72, 73.5 per cent

delivery room. Rh negative blood or donors should be available for the Rh negative patient. Blood loss in placenta previa may necessitate more than one transfusion and it is more than possible that a patient may be sensitized by the transfusion of Rh positive blood. These smaller institutions should stock plasma which can be administered while blood is secured. The State Health Departments are making plans to supply blood and plasma to hospitals so that this need may be met. It was possible to build up a world wide organization to supply blood to our troops in time of war and it should be possible to use our experiences to extend this boon to our civilian population in times of peace.

Parenteral fluids are valuable in the treatment of hemorrhage but they should be administered in conjunction with blood and not in place of it. Ringer's or saline solution can be given subcutaneously in liberal amounts. The intravenous use of hypertonic glucose solutions should be restricted until blood is available. In an emergency 500 cubic centimeters of a 20 per cent glucose solution will raise the blood pressure and help to maintain the circulation temporarily but a secondary and a more serious drop in blood pressure may ensue unless blood is administered.

PROGNOSIS

The prognosis for the mother in placenta previa has improved to such an extent that deaths from placenta previa should be almost preventable in an urban community. The mortality from this complication can be kept below 1 or 2 per cent by making use of all the knowledge that is available today and the facilities of the large maternities. The morbidity and mortality in this group of patients are listed in Table IX. The overall morbidity of 22 per cent can be improved by greater care in the management of this complication. These patients were treated over a period of more than 14 years and many changes have occurred in the therapy of some of the complications listed under morbidity.

The danger of infection and thrombophlebitis is emphasized in our statistics. Together they accounted for the morbidity in 57 of the 72 patients. Sulfa drugs and antibiotics have decreased the hazard of infection to some extent in the last few years but much remains to be accomplished along these lines. Twenty of our patients, including the fatal case, developed thrombophlebitis. Infection predisposes to thrombosis but the location of the placental site is the most important contributory factor. Measures to combat thrombosis have not been used extensively and are still on trial. Much more investigative and clinical observations are necessary to extend the use of the several anticoagulants to obstetrics.

The maternal mortality in this group of patients was 0.6 per cent. Résumés of the histories of the 2 patients who died follow:

M. H., No. 160045, aged 33 years, tripara, quintigravida, 1 abortion, was first examined when 20 weeks pregnant. History and physical findings were essentially normal. At 37 weeks there was painless bleeding and vaginal examination revealed marginal placenta previa. At 37½ weeks sudden profuse hemorrhage of 600 cubic centimeters occurred. Laparotrachelotomy with tubal ligation was carried out under local anesthesia. On the 3rd postoperative day her temperature was 38.8 degrees, and cough and râles in the left lower lobe were present. On the 9th postoperative day she had continued fever, pain and swelling in the left leg. On the 10th postoperative day there was present moderate purulent discharge from the wound. On the 14th day she had pain in the left chest and râles, temperature was 38.5 degrees and pulse 100. On the 16th day her condition was unchanged; however, at noon she developed sudden dyspnea, cyanosis, weak rapid pulse, cold clammy skin, but no evidence of acute pulmonary edema, and expired. Autopsy revealed bilateral massive acute pulmonary embolism and old infected pulmonary infarcts.

M. D., No. 65996, aged 37 years, tripara, quadrigravida, 1 stillbirth, anemia in 1937, was first examined when 18 weeks pregnant, at which time she had varices and monilia vaginitis. When 40 weeks pregnant she was admitted for study; hypertension: 170/120. At 41 weeks medical induction failed; bleeding was 75 cubic centimeters. Vaginal examination revealed total placenta previa. Laparotrachelotomy was carried out under local anesthesia; incision through placenta with marked bleeding, 600 cubic centimeters. Manual removal of placenta, tight packing. At time of skin closure, the blood pressure could not be obtained. Patient given caffeine, ephedrine, fluids, transfusion; 1000 cubic centimeters of blood expressed from uterus; second transfusion given. Respirations shallow, pulse weak, blood pressure 0. She expired 2 hours after operation. Autopsy showed exsanguination, atelectasis of both lower lobes, meconium in pulmonary vessels, fatty changes in liver.

Both of these deaths have been classified as preventable by our staff. The patient who died of hemorrhage bled profusely throughout the operation without anyone in attendance being aware of the gravity of her condition. More clinical experience on the part of the obstetrician would have prevented this fatality. The second patient was admitted to the hospital because of painless bleeding and a diagnosis of placenta previa was made on vaginal examination. The termination of the pregnancy was delayed 4 days when a sudden profuse hemorrhage of 600 cubic centimeters necessitated abdominal delivery. She developed a puerperal infection, pelvic thrombophlebitis and succumbed from a pulmonary infarct on the sixteenth day. It is possible that the termination of the pregnancy at the time the diagnosis of placenta previa was established would have decreased the hazard of infection and the subsequent thrombophlebitis. Delivery 3 or 4 days after a vaginal examination in a patient with placenta previa is a most inopportune time in regard to the hazard of infection.

The prognosis for the baby in placenta previa is serious as the statistics in Tables X and XI indicate. Of 329 babies who were born to the 325 mothers, 225 or 68.4 per cent were discharged from the hospital alive. The 104 babies who did not survive were equally divided between stillbirths and neonatal deaths.

The most important cause for the failure of the baby to survive was prematurity. Our policy of terminating the gestation promptly when the diagnosis of placenta previa is established must necessarily result in the sacrifice of many babies too young to survive an extrauterine existence. Only 1 baby of 29 weighing less than 1000 grams survived although 10 were delivered alive. In the group weighing 1000 to 2500 grams there were 119 babies of whom 95 were born alive but only 62 or 65.3 per cent of these survived. However, babies weighing more than 2500 grams fared much better for 172 of 181 were born alive and 162 or 94.2 per cent of these survived and were discharged from the hospital.

Up to the present time the previable and the premature baby have been considered expendable in order to insure the greatest possible safety for the mother. The dangers of hemorrhage, infection, and thrombophlebitis preclude the continuation of the pregnancy in the patient in whom placenta previa is diagnosed. It is possible that this viewpoint may change. The patient who remains in a hospital where blood can be administered readily may run little risk from serious blood loss. The prophylactic use of the newer antibiotics may decrease the hazard of infection. Cesarean section provides a safer method of delivery for the premature fetus than delivery through

the pelvis. However, we must never lose sight of the fact that once a cesarean is performed future deliveries must be by the abdominal route. All of these factors will have to receive their proper weight in any future decision to change our present management which has yielded such excellent results for our mothers.

CONCLUSIONS

Placenta previa is still a major cause of morbidity and mortality but modern management has robbed this condition of much of its terror. It has been possible to deliver 325 consecutive patients with placenta previa during the years 1931 to 1945 with a maternal mortality of 0.6 per cent.

The following procedure is followed at the Chicago Lying-in Hospital. All patients who have vaginal bleeding late in pregnancy are referred to the hospital for examination, diagnosis, and treatment. When suitable blood is available, a vaginal examination is carried out to determine the presence of placenta previa, its extent, the condition of the cervix, fetal position, the adequacy of the pelvis and the state of the soft parts. These factors plus the age, parity, and the physical condition of the patient will determine the choice of treatment for the control of bleeding and delivery. Some of the accepted methods of treatment made honorable by tradition have no place in the modern hospital.

CAUSALGIA

A Study of 75 Cases

JACK L. ULMER, M.D., F.A.C.S., Major, M.C., A.U.S., Richmond, Virginia, and
FRANK H. MAYFIELD, M.D., F.A.C.S., Lieutenant Colonel, M.C., A.U.S.,
Cincinnati, Ohio

THE term "causalgia" was first used by Mitchell, Morehouse, and Keen in 1864 to designate a bizarre symptom complex occurring after injury to peripheral nerves. The main features of this symptom complex are severe burning pain and hyperesthesia, in association with trophic and vasomotor changes in the injured extremity. Little is known about the fundamental cause of this condition, and the theories advanced to explain it are so numerous that no attempt shall be made to develop them. Suffice it to say that in certain individuals following injury to one or more peripheral nerves a painful reflex mechanism is set in motion which is accompanied by abnormal vasomotor activity, manifested by varying degrees of vasodilatation or vasoconstriction. Relief can be obtained in most instances by surgical interruption of the appropriate sympathetic pathways.

In this paper we present the data from 75 patients who showed this symptom complex. Fifteen of these cases have previously been reported by one of us, with Captain Devine (3). These 75 cases were encountered in a series of 1,477 peripheral nerve injury cases admitted to the neurosurgical service of Percy Jones General Hospital from January 15, 1943, to May 31, 1945, an incidence of approximately 5 per cent. Three patients were officers and 72 enlisted men. The ages ranged from 19 to 39 years.

The peripheral nerve injury was incomplete in every instance and resulted from penetrating shell fragment or bullet wounds. The sciatic nerve was involved in 29 cases; the median in 16 cases; the brachial plexus (predominantly the lateral and medial cords) in 13 cases; the median and ulnar in 8 cases; the median, ulnar, and radial in 3 cases; the tibial and peroneal (below the knee) in 2 cases; the tibial in 2 cases; the median and radial in 1 case; and the femoral nerve in 1 case. The nerve injury was proximal to the elbow or knee in 66 cases (88 per cent) and distal in 9 cases (12 per cent). No patient had accompanying major vascular injuries.

In 44 of the 75 cases the burning pain developed immediately after the injury, in 14 within the first 48 hours, and in the rest (17) in from 72 hours to 2 months. The symptoms had been present for periods of time ranging from 3½ weeks to 15 months. The majority of patients were treated within 4 months from the time of injury.

SYMPTOMS AND SIGNS

The cardinal symptom in each case was burning pain of a throbbing or aching character. The pain was always referred to the distal part of the involved extremity and was not confined to the autonomous zone of the injured nerve though it was usually more intense in that zone. In the hand it was referred chiefly to the palm and fingers; in the foot, to the instep, sole, and toes. The intensity varied from less severe states to the unbearable. The pain was continuous but subject to exacerbation by the slightest emotional or physical stimulus, and most of these patients appeared in a perpetual state of defense and went to absurd extremes to protect the painful limb. The severity of the pain rendered an accurate assessment of the nerve injury impossible in many cases.

The vasomotor manifestations were of two types, vasodilatation and vasoconstriction, and in no case was there noticeable alteration

From the Neurosurgical Section, Percy Jones Hospital Center, Battle Creek, Michigan.
Read at the Surgical Conference of the Sixth Service Command, Chicago, Illinois, July 28, 1945.

TABLE—SUMMARY OF CASES*

Case Age	Injury	Onset	Duration	Relief from moisture	Nerves involved	Treatment	Result
1 B.I.L. 22	Bullet, left wrist	24 hours	7 mo.	Cold	Median	Sympathectomy, preganglionic, D.2–3	Relief
2 A.M. 20	Shell fragment, left leg	Immediate	4½ mo.	Cold	Tibial and peroneal	Sympathectomy, L.2–3	Relief
3 V.V.S. 22	Bullet, left buttock	2 weeks	5½ mo.	Cold	Sciatic	Sympathectomy, L.1–2–3	Relief
4 H.W.R. 30	Shell fragment, right thigh	Immediate	6 weeks	Cold	Sciatic	Sympathectomy, L.2–3	Relief
5 P.K.F. 34	Shell fragment, left arm	4 days	5 mo.	Cold	Median, ulnar and radial	Sympathectomy, preganglionic, D.2–3	Relief
6 E.F.A. 24	Shell fragment, left buttock	Immediate	6 mo.	Warm	Sciatic	Sympathectomy, L.1–2–3–4	Relief
7 T.I.D. 26	Shell fragment, left buttock	Immediate	3 mo.	Warm	Sciatic	Sympathectomy, L.1–2–3–4, D.11–12	Relief
8 C.M. 30	Shell fragment, right thigh	Immediate	6½ mo.	Warm	Sciatic	Sympathectomy, L.2–3	Relief
9 J.S. 28	Shell fragment, right thigh	Immediate	2¼ mo.	Warm	Sciatic	Sympathectomy, L.2–3–4	Relief
10 C.D.C. 27	Bullet, left arm	Immediate	5 mo.	Warm	Median	Sympathectomy, preganglionic, D.2–3	Relief
11 J.B.L. 26	Shell fragment, left neck	24 hours	5¼ mo.	Warm	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief
12 F.J.D. 27	Shell fragment, right arm	48 hours	7¾ hrs.	Warm	Median	Sympathectomy, preganglionic, D.2–3	Relief
13 E.S. 22	Shell fragment, right thigh	24 hours	5¾ mo.	Warm	Sciatic	Sympathectomy, L.2–3	Relief
14 W.C.S. 23	Shell fragment, left forearm	Immediate	4¼ mo.	Warm	Median and ulnar	Sympathectomy, preganglionic, D.2–3	Relief
15 J.H.M. 22	Shell fragment, left leg	Immediate	2 mo.	Warm	Tibial	Sympathectomy, L.2–3	Relief
16 M.E.L. 31	Bullet, right arm	2 weeks	6 mo.	Warm	Median	Sympathectomy, preganglionic, D.2–3	Relief
17 C.M. 31	Shell fragment, right thigh	Immediate	3½ mo.	Cold	Sciatic	Sympathectomy, L.2–3	Relief
18 C.W.P. 23	Shell fragment, right buttock	Immediate	5 mo.	Warm	Sciatic	Sympathectomy, L.1–2–3	Relief
19 J.K.S. 20	Shell fragment, right thigh	Immediate	4 mo.	Warm	Sciatic	Sympathectomy, L.2–3	Relief
20 J.C.G. 22	Shell fragment, left leg	48 hours	1½ mo.	Cold	Tibial and peroneal	Sympathectomy, L.2–3	Relief
21 H.A.S. 31	Shell fragment, left axilla	6 weeks	3½ mo.	Warm	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief

*The first 15 of the 75 cases were summarized in a previous publication (3).

TABLE—SUMMARY OF CASES*—Continued

Case Age	Injury	Onset	Duration	Relief from moisture	Nerves involved	Treatment	Result
22 E.V.Z. 23	Shell fragment, left thigh	Immediate	4 mo.	Cold	Sciatic	Sympathectomy, L.2–3	Relief
23 B.J.W. 19	Shell fragment, right thigh	2 weeks	3¾ mo.	Cold	Sciatic	Sympathectomy, L.2–3	Relief
24 L.M.S. 28	Shell fragment, right forearm	Immediate	2½ mo.	Warm	Median and ulnar	Sympathectomy, preganglionic, D.2–3	Relief
25 W.E.R. 29	Bullet, left axilla	2 weeks	4¼ mo.	Cold	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief
26 S.P.C. 36	Shell fragment, left forearm	Immediate	3½ weeks	Warm	Median	Sympathectomy, preganglionic, D.3–4 Later neurorrhaphy, median nerve	Relief
27 A.B.Z. 31	Bullet, left neck	Immediate	3 mo.	Warm	Brachial plexus	Sympathectomy, preganglionic, D.3–4 Later neurolysis of 8 C. and 1 D. roots	Relief
28 R.L.Y. 26	Bullet, right thigh	Immediate	1¾ mo.	Cold	Sciatic	Sympathectomy, L.2–3–4	Relief
29 U.G.U. 26	Shell fragment, left axilla	Immediate	15 mo.	Warm	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief
30 M.A.H. 37	Bullet, right axilla	Immediate	4 mo.	Cold	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief
31 C.L.S. 26	Shell fragment, left arm	Immediate	2 mo.	Cold	Median	Sympathectomy, preganglionic, D.2–3	Relief
32 R.C.W. 19	Shell fragment, left axilla	Immediate	3 1/5 mo.	Cold	Median and ulnar	Sympathectomy, preganglionic, D.2–3	Relief
33 D.E.S. 21	Shell fragment, left arm	48 hours	5 mo.	Cold	Median and ulnar	Sympathectomy, preganglionic, D.2–3	Relief
34 J.W.B. 20	Shell fragment, left thigh	Immediate	3½ mo.	Cold	Sciatic	Sympathectomy, L.2–3	Relief
35 T.C. 28	Bullet, left arm	48 hours	6½ mo.	None	Median	Sympathectomy, preganglionic, D 2–3	Relief
36 E.D. 37	Shell fragment, right thigh	4 days	7 mo.	Warm	Sciatic	Sympathectomy, L.1–2–3	Relief
37 T.H.J. 21	Shell fragment, left arm	Immediate	8 mo.	Warm	Median	Sympathectomy, preganglionic, D.2–3	Relief
38 P.C.N. 33	Shell fragment, right neck	48 hours	6 mo.	Cold	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief
39 M.A.C. 21	Bullet, right thigh	Immediate	2 mo.	Cold	Sciatic	Neurorrhaphy	Relief
40 L.E.N. 24	Bullet, left thigh	Immediate	3 mo.	Warm	Sciatic	Neurorrhaphy	Relief
41 E.E.V. 25	Bullet, left forearm	Immediate	5 mo.	Warm	Median and radial	Sympathectomy, preganglionic, D.2–3	Relief
42 L.A.S. 26	Shell fragment, right axilla	Immediate	3½ mo.	Warm	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief

*The first 15 of the 75 cases were summarized in a previous publication (3).

TABLE—SUMMARY OF CASES*—Concluded

Case Age	Injury	Onset	Duration	Relief from moisture	Nerves involved	Treatment	Result
43 S.W. 30	Bullet, left arm	Immediate	2 mo.	Warm	Median, radial and ulnar	Sympathectomy, preganglionic, D.2–3	Relief
44 D.A.L. 23	Shell fragment, right buttock	2 weeks	2½ mo.	Cold	Sciatic	Sympathectomy, L.1–2–3–4, D.11–12	Relief
45 F.A. 33	Shell fragment, right axilla	1 week	4 mo.	Cold	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief
46 H.D.W. 23	Bullet, left axilla	Immediate	3 mo.	Cold	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief
47 C.E.H. 20	Bullet, right thigh	Immediate	4 mo.	Cold	Femoral	Sympathectomy, L.1–2–3–4	Relief
48 E.P.S. 33	Shell fragment, right arm	Immediate	6½ mo.	Cold	Median, ulnar and radial	Sympathectomy, preganglionic, D.2–3	Relief
49 F.M.C. 24	Shell fragment, left arm	Immediate	3½ mo.	None	Median and ulnar	Sympathectomy, preganglionic, D.2–3	Relief
50 S.J.L. 39	Shell fragment, right axilla	Immediate	3 mo.	Warm	Median	Sympathectomy, preganglionic, D.2–3	Relief
51 F.C.R. 25	Shell fragment, left thigh	3 days	5 mo.	Cold	Sciatic	Sympathectomy, L.1–2–3	Relief
52 R.E.L. 25	Bullet, left thigh	4 days	5 weeks	Cold	Sciatic	Sympathectomy, L.1–2–3	Relief
53 A.S.F. 24	Shell fragment, left thigh	1 week	7 weeks	Cold	Sciatic	Sympathectomy, L.1–2–3	Relief
54 S.R.H. 26	Bullet. left axilla	Immediate	3 mo.	Cold	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief
55 W.M.B. 30	Bullet, rignt thigh	2 mo.	3½ mo.	None	Sciatic	Sympathectomy, L.1–2–3–4	Relief
56 V.H.K. 28	Shell fragment, right thigh	2 weeks	2¼ mo.	Warm	Sciatic	Sympathectomy, L.1–2–3	Relief
57 F.W.S. 29	Shell fragment, right axilla	16 hours	2½ mo.	Cold	Brachial plexus	Sympathectomy, preganglionic, D.2–3	Relief
58 W.P.C. 20	Shell fragment, left arm	Immediate	5¼ mo.	Warm	Median and ulnar	Sympathectomy, preganglionic, D.2–3	Relief
59 D.S.S. 23	Bullet, left axilla	24 hours	2½ mo.	None	Median and ulnar	Sympathectomy, preganglionic, D.2–3	Relief
60 F.I.S. 21	Shell fragment, right leg	48 hours	1 mo.	Cold	Tibial	Sympathectomy, L.2–3–4	Relief

*The first 15 of the 75 cases were summarized in a previous publication (3).

in the type while the patient was under our observation. The skin of those in vasodilatation was usually reddish, dry, scaly, and warmer than that of the normal extremity and the hair long and coarse. The skin of those in vasoconstriction was usually cold, thin, and glistening, and sweated profusely. In this group there was usually loss of hair, tapering of the digits, and trophic changes in the nails.

Sixty-eight of the 75 patients obtained some relief from the application of moisture. Thir-

ty-eight preferred cold water; 30, warm water; and 7 noted no significant effect of moisture. It seemed that warm water gave relief where there was vasoconstriction and cold where there was vasodilatation.

Most of these extremities showed gradations of joint stiffness brought on by painful splinting and disuse. This was one of the greatest residuals after the relief of pain but proved amenable to physical therapy if treated early.

In the more severe cases, the patients were usually malnourished because of low food-intake.

Most of these patients were irritable, shut-in, critical of attendants, and showed no interest in family or friends even though they had been overseas for many months. Their facial expression manifested evidence of anxiety, weariness, and distress. These findings suggested that the disorder might be functional, so psychiatric examinations were carried out in some of our patients before and after operation. After relief of the pain, all appeared essentially stable and normal, and without exception they became pleasant, co-operative, and happy. In our patients there was no evidence of any definite predisposing constitutional factor responsible for the development of this syndrome.

There appeared to be no correlation between the severity of the nerve injury and the intensity of symptoms. The nerve lesion was incomplete in each case.

METHODS OF STUDY

These patients were studied to correlate subjective symptoms and trophic disturbances with blood flow in the injured part. Blood flow was determined by means of oscillometric and skin temperature readings in the first 15 cases and by skin temperature readings alone in the rest. Those in vasodilatation usually showed skin temperature readings from 1 to 4 degrees higher than readings of corresponding areas of the normal extremity; those in vasoconstriction showed readings from 2 to 6 degrees lower.

One patient in vasoconstriction developed malaria (Plasmodium vivax) and during the periods of elevation of temperature was completely free of pain. The pain returned, however, when the malaria was controlled. Because of this observation, artificial fever therapy was tried in 5 patients, 1 of whom remained well after 3 treatments. The others received as many as 5 treatments, with relief for the period of elevated temperature only. Subsequent sympathectomy was followed by relief in these 4 patients.

X-ray film of the painful part was made in 20 cases. Each showed some degree of demineralization of the small bones of the hand or foot as contrasted to the normal. The changes were most marked in those in vasodilatation. However, the demineralization appeared no more pronounced than in some cases of comparable nerve injuries without causalgia.

TREATMENT

Seventy-two of our patients were treated by surgical procedures, 70 by surgical interruption of the sympathetic chain, which included preganglionic ramisectomy of the second and third dorsal ganglia for the upper extremity and removal of the second and third lumbar ganglia for the lower extremity. Sixty-three of the 70 were cured by the initial operation.

Two patients with severe but incomplete lesions of the sciatic nerve were treated by resection of the injured segment and neurorrhaphy. This procedure relieved the pain in both instances.

In every case, procaine block of the appropriate sympathetic ganglia was done before definitive treatment was carried out. This procedure invariably gave immediate and dramatic relief of the pain for periods ranging from 1 to 3 hours, but in most patients it reached its previous intensity in a very short time. In a few, partial relief persisted for several days. During the period of remission, the patient became co-operative and permitted a more thorough sensory and motor evaluation of the involved extremity, whereas examination was unreliable before the pain was relieved. Frequently, where no motor function had been observed previously, the patient began to move the extremity immediately. This suggested that in some of the

cases the pain had initiated a reflex paralysis (Livingston).

Since numerous reports have been made of permanent cures from one or more sympathetic blocks, some patients were injected 4 to 8 times. There was always immediate relief of the pain, but no patient obtained complete and permanent relief from this procedure. However, the sympathetic block served two useful purposes: First, by relieving the pain temporarily it permitted a more accurate evaluation of the nerve injury; and second, it established the indication for sympathectomy. In the last 55 cases, this procedure was used for diagnosis only.

Neurolysis was done in 5 cases and periarterial sympathectomy at the level of the injury in 3 cases, but the pain was not influenced by these procedures. Later these patients were sympathectomized with relief.

SPECIAL CASES

Seven patients were not completely cured by the initial operation on the sympathetic chain but 4 were cured by subsequent operations. These deserve special comment.

Three patients with high sciatic injuries (buttock or above) obtained partial relief after removal of the second, third, and fourth lumbar ganglia. Later removal of the first lumbar ganglion resulted in complete relief.

Another patient with a similar lesion had the first, second, third, and fourth lumbar ganglia removed initially. Following this he was completely relieved of pain for 72 hours, when moderate pain recurred. Paravertebral procaine blocks at the level of the eleventh and twelfth dorsal vertebrae gave immediate and complete though temporary relief on two occasions. A starch-iodine test demonstrated sweating over the buttock, leg, and dorsum of the foot. It was concluded that some sympathetic fibers to the injured segment of nerve remained. The eleventh and twelfth dorsal ganglia were removed by resecting the twelfth rib. At this operation the diaphragm was sectioned to verify that the upper lumbar chain had been removed. Complete relief followed.

A similar patient with a sciatic lesion at the buttock had the second, third, and fourth lumbar ganglia removed, followed by incomplete relief. Procaine block at the level of the first lumbar vertebra gave temporary relief. The first lumbar ganglion was then removed without benefit. Procaine injection at the eleventh and twelfth dorsal vertebrae gave complete relief on two occasions. With this evidence plus the fact that sweating persisted in the location of the pain and also at the level of the injury, the eleventh and twelfth dorsal ganglia were removed and complete relief followed.

Two patients with lesions of the upper extremity had the third and fourth dorsal ganglia interrupted instead of the second and third because of mistaking the fourth rib for the third in the exposure. This produced only partial interruption of the sympathetic supply to the involved limb and these patients were only partially relieved. The first patient was then relieved by a neurorrhaphy of the median nerve. In the second case neurolysis of the eighth cervical and first dorsal roots did not affect his symptoms. However, he has since improved to the point where no further surgical interference seems indicated.

DISCUSSION

In each case of this series, symptoms resulted from high velocity missile wounds of large mixed peripheral nerves and we feel that they represent true causalgia. For a time it was felt that causalgia was a distinct entity, but the underlying disorder is no doubt related to that of a heterogeneous group of painful posttraumatic dystrophies, including Sudeck's atrophy, posttraumatic painful osteoporosis, and other so-called minor causalgias (Homans). The chief difference is one of degree, perhaps, varying with the size of the nerve involved.

The vasomotor disturbance was of two types, vasodilatation and vasoconstriction. Forty patients of this group were in vasodilatation and 35 in vasoconstriction. The subjective symptoms were identical but the objective signs varied, yet interruption of the sympathetic chain relieved the pain in both groups. Therefore, it would appear that alteration of blood flow was not responsible for the pain.

In the majority of our cases the intense burning pain occurred immediately after the injury, which rules out infection and irritative scar formation as significant etiologic factors. In fact, with rare exception the traumatic wounds healed without gross infection.

The trophic manifestations in some cases were essentially the same as those seen in comparable nerve injuries without causalgia, but the secondary joint changes with resulting fibrous ankylosis were more severe because of voluntary immobilization of the painful extremity.

Seven patients of this group failed to obtain complete relief from the initial operation upon the sympathetic chain. Five were patients with wounds involving the sciatic nerve at the buttock or above. Removal of the second and third lumbar ganglia had been effected in each case. Subsequent removal of the first lumbar ganglion in 3 of these resulted in complete cure. In 2, removal of the eleventh and twelfth dorsal and first lumbar ganglia were required. In the other 2 cases which involved the upper extremity, incomplete sympathectomy was done at the initial procedure when the fourth rib was removed instead of the third. One patient was then relieved by neurorrhaphy of the median nerve. In the other case, neurolysis of the eighth cervical and first dorsal roots did not affect his symptoms. However, he has since improved to the point where no further surgical interference seems indicated.

Those patients not relieved by the initial sympathectomy showed evidence of incomplete sympathetic denervation, not only to the area of referred pain, but to the area of injury. This was verified by sweating in these areas as shown by starch-iodine tests and evidence of lowered skin resistance to electrical conduction. This has been more noticeable in the cases involving the lower extremity where the injury was high in the thigh.

From these observations, it would appear that the sympathectomy must include the injured segment of nerve. However, the possibility of anomalies of the sympathetic chain must be considered. It can be stated that removal of the second, third, and fourth lumbar ganglia may be inadequate for lesions high in the thigh. In these cases it may be necessary to remove the first lumbar as well as the eleventh and twelfth dorsal ganglia. For lesions of the upper extremity preganglionic sympathectomy of the second and third dorsal ganglia is necessary. The segment of the sympathetic chain removed has been identified postoperatively by x-ray examination through the use of a metallic clip on the proximal end of the chain when the lumbar operation was done and identity of the rib removed when the dorsal operation was done.

Various medical and surgical treatments have been advocated for the cure of causalgia but in our experience surgical interruption of the appropriate sympathetic ganglia has been the most effective procedure. It has provided relief in each case and has the advantage of carrying a minimal penalty, in contrast to more radical surgical procedures such as regional injection of alcohol, rhizotomy, and chordotomy.

SUMMARY AND CONCLUSIONS

The data from 75 cases of causalgia due to war wounds of large mixed peripheral nerves have been presented and the following conclusions are drawn.

1. The pathologic mechanism is obscure.

2. The disorder is characterized by burning pain in association with vasomotor disturbances in the distal part of the extremity.

3. The vasomotor disturbances are of two types, vasoconstriction or vasodilatation. The possibility that the vasomotor state may vary in any case is recognized but has not been observed.

4. The pain can be relieved by appropriate sympathectomy. The sympathectomy must be complete, however, and with lesions involving the upper portion of the sciatic nerve removal of the sympathetic chain as high as the eleventh dorsal ganglion may be required. For lesions of the upper extremity preganglionic operation is adequate.

5. Procaine block of the appropriate chain is a necessary diagnostic procedure.

6. Repeated procaine block as a therapeutic agent has not been effective in our hands. Certain patients have improved with this procedure, but none has been completely relieved.

7. Resection of the injured segment of nerve will provide relief. Neurolysis and periarterial sympathectomy at the level of the injury are ineffective.

8. Sympathectomy should be done as soon as the diagnosis is established, to prevent the psychic trauma of prolonged pain and crippling joint stiffness.

9. Causalgia has been noted only with incomplete nerve lesions.

10. Recovery of function is often rapid after relief of pain. Consequently, primary neurorrhaphy is rarely indicated.

NOTE.—Our series of causalgia cases treated by sympathectomy now totals 105 cases as of December 31, 1945, including 2 additional cases of high sciatic injury requiring removal of the 11th and 12th dorsal ganglia, and the results and conclusions remain the same. For the same period 2,318 cases of peripheral nerve injuries were admitted.

REFERENCES

1. HOMANS, JOHN. Ann. Surg., 1941, 113: 932
2. LIVINGSTON, W. K. Pain Mechanism. New York: The Macmillan Co., 1943.
3. MAYFIELD, FRANK H., and DEVINE, JOHN W. Surg. Gyn. Obst., 1945. 80: 631.
4. MITCHELL, S. W., MOREHOSE G. R., and KEEN, W. W. Gunshot Wounds and Other Injuries of Nerves. Philadelphia: J.B. Lippincott Co., 1864.
5. TINEL, J. Rev. Neur., Par., 1919, 26: 521-526.

TREATMENT OF PAINFUL SPONDYLOLISTHESIS

J. PUIG GURI, M.D.

SINCE the introduction of surgical procedures for the treatment of painful spondylolisthesis, one of the most frequent problems that the orthopedic surgeon has to face is to decide whether a specific case has to be treated conservatively or requires a spinal fusion. On the other hand, when this decision has been reached, and a spinal fusion is indicated, the next problem is in regard to the type of operative technique that will prove most satisfactory.

Some French surgeons oppose the use of the Albee technique on the basis that the graft is situated too far posteriorly (Guilleminet); that in the event of an associated spina bifida, it is impossible to obtain a solid insertion of the osseous transplant (Salmon and Contiades); or that when the superior spinal segment is markedly displaced, it is difficult to obtain good contact between the graft and the spinous processes (Mathieu and Demirleau). The technique preferred by most of these authors is the use of two flexible osteoperiosteal grafts placed on either side of the spinous processes. Desfosses and Colleu have advised the use of small grafts inserted between the superior and inferior articular processes, in order to obtain a bridging of the abnormal gap in the neural arch.

Because all these previously described techniques have no direct action upon the anterior part of the vertebra—where the real displacement takes place—several other procedures have been introduced directed toward producing a fusion between the vertebral bodies or the transverse processes of the fifth lumbar vertebra and the iliac bones, by means of an osseous transplant (Lance and Aurrousseau, Friberg, Mathieu and Demirleau, Zahradnicek). Others, following Capener's suggestion have been fusing the fifth lumbar body to the sacrum by means of a tibial graft placed through a transabdominal route (Burns, Jenkins, Kellog Speed, Mercer, Friberg). Finally, Dandy emphasizes the importance of the intervertebral disc pathology in cases of spondylolisthesis and advises the curettement of the defective disc or discs, and the fusion of the anterior spine.

In this clinic the surgical treatment of painful spondylolisthesis consisted of the use of the Hibbs' technique or a combination of those of Albee and Hibbs as described by Steindler. Technically both procedures have been safe and easily accomplished. However, they are not indicated unless there is assurance that the results obtained will be superior to results obtained by conservative treatment and that the procedures will prevent further slipping of the displaced vertebral bodies.

The purpose of this report is the review of the end-results of cases having a long term follow-up. The material available consisted of 313 cases of spondylolisthesis. For this analysis we selected those cases having good clinical and radiographic follow-up for at least 2 years after initiation of treatment. Cases with other extraspinal conditions that could mask the evaluation of the end-results (osteoarthritis of the hips, old fractures of femur or tibia, poliomyelitis of lowers) were also excluded.

There were 60 cases that fulfilled all these requirements. These patients were treated either conservatively or surgically or by a sequence of both. There were 45 males and 15 females. The age of the patients ranged from 12 to 55 years.

RESPONSE TO TREATMENT

Conservative measures. Thirty-four patients were treated by physiotherapy, traction, and spinal support. The results were as follows:

Complete relief, characterized by complete freedom from pain and ability to resume former occupation, was obtained in 14 cases (41.1%). In 1 of these cases back pain recurred after a symptom-free period of 10 years.

Partial relief, characterized by back pain only after exertion, was obtained in 12 cases (35.2%).

From the Department of Orthopedic Surgery, State University of Iowa, Iowa City, Dr. Arthur Steindler, Director.

No relief in 8 cases (23.5%).

Spinal fusion. These cases are divided in 2 categories:

1. Patients treated by fusion without previous trial of conservative treatment. In 26 cases spinal fusion was performed within a few weeks after the patient was admitted, or as soon as the acute episode of back pain had been relieved by physiotherapy and traction. The results were as follows: Complete relief, characterized by freedom from pain and ability not only to resume their former occupations but also their habitual sports, was obtained in 20 cases (76.9%). The observation period of these cases ranged from 2 to 8 years after operation was performed (average observation period was 3.5 years). Partial relief, characterized by some back pain after exertion, in 5 cases (19.2%). No relief in 1 case (3.8%).

2. Patients treated by fusion after trial with conservative treatment. In 13 cases of spondylolisthesis in which the conservative treatment had produced only partial relief or no relief at all, spinal fusion was ultimately performed. The results were as follows: Complete relief of symptoms was obtained in 7 cases (53.8%). These patients had been subjected to conservative treatment before the operation for periods of time ranging from 4 months to 5 years. The follow-up after spinal fusion was from 2 to 11 years (average observation period was 4.5 years). Partial relief of symptoms was obtained in 1 case (7.6%), the patient complaining of some back pain after exertion. Before operation this patient had continuous low back pain with sciatic radiation. No relief of symptoms was obtained in 5 cases (38.4%). These 5 patients were treated conservatively for periods ranging from 6 months to 1½ years, prior to surgery, with no improvement.

COMPARATIVE STATISTICS

If now we consider the results of the total 39 spinal fusions performed and compare with the 34 patients treated conservatively, we will observe that the percentage of good results was superior in the fused cases (69.2%) than in the ones treated by conservative measures (41.1%).

Also in favor of the surgical fusion, we must consider the fact that a certain number of the patients completely symptom free after the fusion of the posterior spine, had failed to respond adequately to conservative treatment.

THE PRESENCE OF SCIATIC RADIATION IN CASES OF SPONDYLOLISTHESIS

In 4 of the patients who failed to improve after surgical treatment, there was low back pain with associated sciatic radiation as far down as the ankle or toes. Since in recent years the rôle of the intervertebral disc as cause of low back pain has been greatly emphasized, these cases were rechecked for the possibility of overlooked disc pathology associated with the vertebral displacement.

The fact that these patients continued to complain of sciatic radiation after fusion was strongly in favor of this supposition. But it will be erroneous to form hasty conclusions based only on these 4 cases and state that the presence of a definite and persistent sciatic radiation before treatment constitutes a sign that all the symptoms will persist unless removal or curettage of the disc is performed.

Review of the histories of all the 60 patients here reported revealed the following:

Low back pain with sciatic radiation as far down as the ankle or toes was a complaint of 18 patients before initiation of treatment. In 10 of these cases, the radiation was unilateral; in the remaining 8, bilateral. In addition to the radiation, 3 patients complained of numbness and paresthesia in the lower extremities. The neurological examination was negative in all but 2, those being cases with unilateral radiation and having bilateral abolished Achilles reflex.

In none of them was the disc explored or curetted. They were treated either conservatively or by fusion of the posterior spine. Under treatment, complete relief of back pain and sciatic radiation was obtained in 10 cases (55.2%); complete relief of the sciatic radiation but some persistence of the back pain was obtained in 4 cases (22.2%); no relief was obtained in 4 cases (22.2%), which had previously been referred to as failures.

In view of these results, we have to accept either Steindler's proposal that there are other

conditions besides a herniated intervertebral disc that may produce sciatic radiation, or the fact that the symptoms produced by a defective disc when spondylolisthesis is present can be relieved in some cases by procedures other than the removal and curettage of the disc.

From a clinical point of view the most important point is the recognition of which patients will show improvement following fusion and which will remain unchanged after the surgical procedure has been performed.

Carefully checking the records of these 18 patients we were unable to find a definite sign. In all of them the neurological examination was inconclusive or negative; the leg signs were positive in both groups; so was the muscular spasm or the presence of sciatic scoliosis. However, there was one factor which appeared consistent and reliable. All patients who failed to respond to surgical fusion of the posterior spine were those who, under previous conservative treatment, had failed to show any degree of improvement. Consequently, it is advisable to treat these cases of spondylolisthesis with sciatic radiation conservatively for a period of time, and to perform an exploration of the intervertebral disc of those failing to respond, prior to fusing the posterior spine.

DEGENERATIVE CHANGES OF THE INTERVERTEBRAL DISC IN CASES OF SPONDYLOLISTHESIS

Degenerative changes in the intervertebral disc have been described by several authors. Schmorl and Junghanns found it deformed, thinner, sometimes S-shaped. Putschar observed the complete interruption of the annulus fibrosus and ossification of the anterior part. Hitchcock states that the buttress that develops on the anterior part of the sacrum in cases of spondylolisthesis is formed in large measure by the dislocation of the intervertebral disc itself.

As a result of this disc degeneration, instability and abnormal mobility at the level of the displaced vertebra are present. Roentgenographically, this is evidenced by the presance of sclerosis and reactive new bone formation.

In order to correct this instability, some surgeons have proposed fusing the anterior spine at the level of the vertebral bodies. Dandy not only advises it, but states that fusion of the posterior spine without removing the discs accomplishes nothing because it merely covers the defective discs and the symptoms continue practically unchanged. Furthermore, he states that after the curettage of the disc the posterior graft will be contraindicated because it prolongs the period of recumbency and adds nothing to the fusion that follows complete removal of the disc.

We have no personal experience on this point but it seems to us that if all the symptoms described by the patient with spondylolisthesis could be relieved by fusing only the vertebral bodies, then one could conclude that in those cases in which spontaneous fusion between the fifth lumbar and the sacrum occurred, there should be freedom from all complaints. However, actual clinical experience does not substantiate this theoretical supposition. Among our material we found 3 cases in which there was an osseous fusion between the fifth lumbar body and the sacrum (Fig. 1), and 2 cases in which the osteophytic formation had been so marked that a solid osseous bridge extended all along the anterior part of the lumbosacral joint. Four of these patients were admitted complaining of recurrent episodes of low back pain of several years' duration. They were completely relieved either by spinal support or after a posterior spinal fusion had been performed.

These apparently contradictory findings cease to appear so paradoxical when, from the narrow field of the intervertebral disc, we turn to consider the vertebral column in its totality. It is then that we realize that in addition to the alterations produced by the defective disc upon the surrounding ligaments and nervous structures, the forward displacement of the whole upper spinal segment will also disturb the physiological harmony of the different structures responsible for the spinal stability and human posture. As a result, an extra burden is placed upon the spinal muscles and the spinal ligaments.

It is our impression that, while in cases of pure intervertebral disc disease or in very mild cases of spondylolisthesis the fusion of the anterior spine may be capable of produc-

ing a permanent relief, in those cases in which a marked forward displacement has already taken place, the posterior spine should be fused in order to provide a better stability for the back.

ROENTGENOGRAPHIC ASPECTS IN SPONDYLOLISTHESIS

The roentgenographic aspects of spondylolisthesis have already been described in detail by several authors (Schmorl and Junghanns, Capener, Brailsford) and consequently a general description is unnecessary. However, we are interested to study this condition through roentgenographic series of several years' duration, in order to determine the sequence of the pathological signs and to determine if there is any progression of the displacement after the conservative or surgical treatment had been undertaken.

One hundred and fifty-one cases were studied in detail. They were divided as follows:

Spondylolisthesis affecting the fifth lumbar vertebra. In 137 cases the displacement occurred at the fifth lumbar vertebra. Of these, 102 belonged to grade 1; 16 to grade 2; 10 to grade 3; 4 to grade 4, of Meyerding's classification. In addition, in 3 cases the displaced vertebra was inside the pelvis, in front of the first or second sacral segment.

Among the cases belonging to grade 1 of Meyerding's classification, the roentgenograms were not uniform. In 56 cases, the intervertebral disc was apparently normal. In 12 there was a thinning of the posterior part of the disc. In 34 the disc was markedly or totally destroyed. Sclerosis of the osseous surfaces could be observed in most of the cases with disc degeneration. In others, a buttress formation was present at the anterior part of the sacrum.

Among the cases belonging to grade 2 of Meyerding's classification, signs of localized osteoarthritis were present and practically all of them presented thinning of the intervertebral disc to variable degrees.

The cases belonging to grades 3 and 4 of Meyerding's classification could be subdivided in two groups, according to whether or not signs of new bone formation were present. When new bone formation took place, a buttress at the anterior part of the sacrum was present in most of the cases, while in others the sacrum and the body of the fifth lumbar were fused together.

On the other hand when new bone formation did not take place, we observed the rounding off of the anterior border of the sacrum and, occasionally, the notching of the inferior surface of the fifth lumbar vertebra, forming what roentgenographically appeared to be a joint-like image between the last lumbar vertebra and the sacrum. The more advanced cases presented a tilting of the fifth lumbar body, a narrowing of the intervertebral foramen between the fourth and fifth lumbar vertebrae, and a flattening of the posterior third of the body of the last presacral segment (Fig. 2). Sclerosis of both osseous surfaces could be observed.

One of the most interesting phenomena was the flattening and redressement of the sacral body. In cases belonging to grades 1 and 2 of Meyerding's classification, the sacrum had a configuration and position compatible with anatomical individual variations. However, in some of the cases belonging to grade 3 and practically all those belonging to grade 4 of Meyerding's classification, on lateral projection the sacrum appeared to have a rounded off anterior border, the conformation was straight, and its position was more vertical than usual (Figs. 3 and 4).

Spondylolisthesis affecting the fourth lumbar vertebra. In 7 cases there was a forward displacement of the fourth lumbar vertebra. All presented a separate neural arch. The displacement was never very marked, corresponding to grades 1 or 2 of Meyerding's classification. In addition there was thinning of the intervertebral disc in 5 cases, localized osteoarthritis in 1 case, and sacralization of the fifth lumbar in 2 cases (Fig. 5).

Pseudospondylolisthesis of Junghanns. According to Sisefsky the term pseudospondylolisthesis was first used by Neugebauer for the cases of violent vertebral dislocation secondary to luxation fracture. More recently, Junghanns has used the same term to designate the dislocation of one vertebra upon another when there is not a preceding intense trauma or a separate neural arch. In addition, he observed

Fig. 1

Fig. 2

Fig. 3

Fig. 1. Osseous synostosis between the fifth lumbar and the sacrum.

Fig. 2. Flattening of the posterior third of the vertebral body of the fifth lumbar vertebra. The intervertebral foramen is narrowed and some sclerosis is present at the anterior border of the sacrum.

Fig. 3. Perpendicular position of the sacrum and rounding off of the anterior border of the sacrum.

Fig. 4. The sacrum appears rounded off, flattened, and occupying a vertical position. The pelvis is more horizontal than usual.

Fig. 4

several other signs: the presence of osteoarthritic changes at the inferior surface of the displaced vertebra and in the upper surface of the body situated just below; the fact that the articular line of the inferior small articulation of the displaced vertebra was more horizontal than the articular lines of the other ones. In the majority of his cases the displacement occurred at the level of the fourth lumbar vertebra.

Fig. 5. Forward displacement of the fourth lumbar body. The fifth lumbar vertebra is sacralized.

More recently Stewart in a collection of Eskimo and Indian skeletons found 3 specimens similar to those described by Junghanns and could observe the existence of marked arthritic erosion of the articular facets of the small intervertebral articulations.

Among our patients we found only 1 case that presented all the characteristics described by Junghanns. The displacement occurred at the level of the fourth lumbar vertebra, and marked osteoarthritic changes of the opposing surfaces of the vertebral bodies were present. No signs of separate neural arch could be detected by lateral, right and left oblique projections. The corresponding intervertebral disc presented definite narrowing.

Reverse spondylolisthesis. The posterior displacement of a vertebral body has been observed by several authors and has received a wide variety of names. Sicard used the term retrospondylolisthesis; Lippens called it hierolisthesis; Mouchet spoke of sacrolisthesis; and finally the American authors (Ferguson, Smith, Johnson) have reported cases under the title of "posterior displacement of the fifth lumbar vertebra."

In spite of so many reports, the existence of such a condition has been denied by Willis, on the basis that we are dealing with an optical illusion. This author studied 50 skeletons of the Haman Museum and found that in only 17 were the opposing surfaces of the fifth lumbar and the sacrum equal. Among the remaining ones, the anteroposterior diameter of the sacrum was from ¼ to 1 inch shorter than that of the opposing surface of the last lumbar vertebra. In addition, in some cases the posterior border of the sacral surface was concave toward the neural canal.

Among our cases studied, we found this condition in 5 cases. The displacement was minimal and affected the fifth lumbar vertebra in all cases. The anterior borders of the fifth lumbar and the sacrum were in alignment. The condition remained stationary.

As there was not a separate neural arch in any of our cases we prefer to use the term "posterior displacement of the fifth lumbar vertebra." In order to avoid confusion it will be advisable to use the term spondylolisthesis only in those cases in which the vertebral displacement is secondary to a separate neural arch.

Scoliosis associated with spondylolisthesis. In 5 cases of spondylolisthesis a lumbar scoliosis was present. The curve extended up to the first lumbar or twelfth dorsal vertebra. There were 1 male and 4 females. The ages ranged from 13 to 16 years when first seen in the clinic. The cases were observed from 2 to 5 years.

While this small number of cases does not allow generalizations, we may state that we observed two main types. On one hand, we had cases in which the rotation of the vertebral bodies was the main characteristic. In these cases the rotation was present several months before the lateral curvature appeared. Under treatment, the lateral deviation could be easily corrected by means of a plaster cast, but the rotation remained unchanged. On the other hand, there was another group of cases in which the lateral deviation was the outstanding phenomenon. When the patients were recumbent, the spine appeared roentgenographically essentially normal. In the standing position, the vertebral bodies presented a minimal amount of rotation. Two of the patients belonging to this group were able at will completely to straighten their spinal curvature.

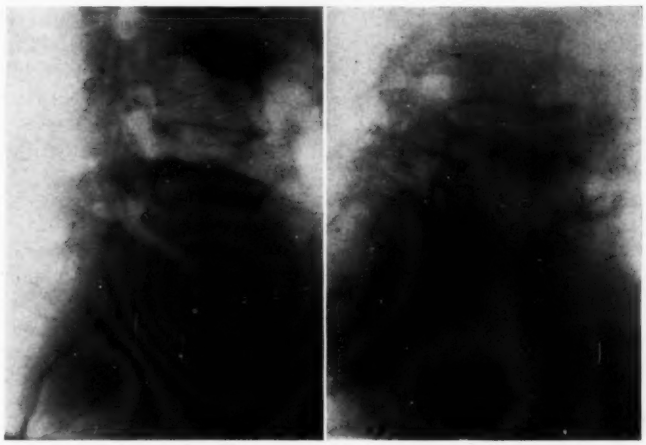


Fig. 6. a and b, The only change that occurred between August 8, 1938, a, left, and December 14, 1944, b, was a thinning of the posterior part of the intervertebral disc. Fusion was carried out in December, 1939.

After spinal fusion, a straight but rotated spine was obtained in the cases belonging to the first group. A normal and painless spine was the end-result in the second group of cases provided that the spinal fusion had been performed during the early periods of the curvature.

The progression of the deformity. In cases of spondylolisthesis affecting the fifth lumbar body, it previously was a widely accepted fact that, except for cases in which a buttress or osseous synostosis was present, the forward slipping could progress at any time, thus increasing the deformity. This concept had been substantiated by reports of several authors who had followed the progressive slipping by serial roentgenograms.

Friberg in 1939 aroused the doubt that progression of the forward slipping was a constant or even frequent phenomenon after puberty. By repeated measurements of the roentgenograms of 142 patients treated conservatively, he was able to find a change in the position of the affected vertebra in only 10 cases. Seven of these patients were under 20 years of age. In all of them the displacement was minimal and could be explained on the basis of a degeneration of the intervertebral disc.

After completion of his study, Friberg concluded that if there was any slipping at all during adult life, it never was to such a degree that would justify the use of dangerous operative procedures. He further stated that in the literature published after 1925 there was not a single convincing picture showing a spontaneous change in the affected vertebral body.

It should be remembered that Ferguson in 1934 had already stated that although a gradual slipping of the displaced vertebra without trauma could be possible, he had never observed a case. He stated also that the displacement did not have much, if any, tendency to increase.

Going over the literature of the past 10 years, we have found several descriptions of cases of progressive slipping reported by Brailsford, Watson-Jones, Ferguson, Burckhardt, Hitchcock. But at any rate the number was comparatively small.

In our material studied we had the opportunity to observe 35 patients for periods ranging from 2 to 7 years. After repeated x-ray films taken approximately every 3 to 6 months, we were unable to find progression of the displacement in any of them. Eleven of these patients had been treated conservatively; 24 of them had been treated by primary fusion or fusion was done after trials of conservative treatment (Fig. 6 a and b).

COMMENT

As spondylolisthesis is not a progressive condition after puberty in the majority of cases, the question arises as to when the displacement occurs.

It is an accepted fact that a marked forward displacement of the body of a vertebra, in the absence of trauma or pathological condition, is only possible because there is a separation at that part of the neural arch that Chandler called the "isthmus." The cause for the appearance of such a gap between the upper and lower articular apophysis of a vertebra has several theoretical explanations. One of the most widely accepted attributes the neural arch defect to a lack of fusion between two centers of ossification present in each half of a neural arch (Rambaud and Renault, Neugebauer). As more recent embryological studies have been unable to prove the existence of these two separate centers of ossification, and the percentage of spondylolysis found in human fetus is far lower than the percentage of separate neural arches observed in adult spines, this congenital theory has been less and less accepted. Other explanations, such as trauma at birth and after (Hitchcock, Azema, Glorieux and Roederer) progressive erosion of the isthmus, localized aseptic necrosis (Julitz), have been formulated by several authors.

Regardless of which of these theories we accept, the fact still remains that while spondylolysis may occur at any level of the spine, a marked forward displacement has only been observed at the fifth lumbar vertebra. This, together with the fact that while spondylolisthesis has been described in several human races it has never been found in the fetus or in the anthropoids (Willis), has called the attention of the anatomists and orthopedic surgeons to the peculiarities of the lumbosacral angle and to the characteristics of human posture.

The evolution of man's posture has been the object of several theoretical suppositions. Disregarding the more or less accepted explanations formulated by Keith, Morton and Wood Jones, we have fairly good evidence that man's posture, as an erect terrestial biped, has suffered several modifications. Boule, in his book *Les hommes fossiles*, states that the Neanderthal man found in "La Chapelle aux Saints" had a crouching posture, a minimal lordosis, and his lower limbs were in slight flexion. On the other hand, Mitchell quotes the studies of Professor Low, who, measuring the skeletons belonging to the Bronze age, found that the posterior vertical measurement of the lumbar vertebrae slightly exceeded the anterior one. Professor Turner reports on his studies on human skeletons during the "Challenger" expedition are widely known. He found that the lumbar spine of one of the most primitive forms of the human race, the Andaman Islanders, was almost straight or slightly convex backwards. Finally, Cunningham, studying the skeletons of several human races from the collections in the British Museum and the Museum of the Royal College of Surgeons in England, found that there was a progressive diminution of the vertical diameter and an increase of the sagittal diameters in Europeans and natives of India as compared with more primitive races such as the Andamans, Australians, and Negroes. This is interpreted as structural modification secondary to adoption of a better posture, because the more erect a man is, the more weight a vertebral body has to carry.

Therefore, we see that the configuration of the human spine has progressively changed, thus permitting more upright posture. However, the human spine has not only changed in configuration during the course of time. During the life span of an individual the vertebral column suffers also several alterations. These different changes have been described in detail by Bardeen, Willis, Carey, Mitchell, and can be summarized as follows:

In an embryo of 7 millimeters the spinal column forms a single curve of forward concavity, the ventral surface of the sacrum facing the mid-thoracic region. From that moment on, there is a progressive uncoiling of the curvature. In an embryo of 50 millimeters the ventral surface of the sacrum faces approximately straight forward.

At birth, the lumbar spine is almost straight and the lumbosacral angle is minimal. Neither the vertebral bodies nor the discs are wedge-shaped.

When the child's hips start to extend, the lumbar vertebrae are pulled forward by the ligamentous structures and the psoas muscles, thus giving origin to the lumbar incurvation. This curve is fairly noticeable around the 9th to 12th postnatal month, when the child begins to stand and walk.

At the end of the second postnatal year a definite wedging of the lumbar vertebrae can be observed. Progressively, the sacral concavity becomes more and more marked and the lumbosacral angle more accentuated. The vertebral wedging increases until the subject reaches adult life.

In short, we may conclude that here we also observe the same phenomenon that took place during the course of ages: the apparition of a lumbosacral angle and of a lumbar lordosis in a previously straight or forward curved lumbosacral spine. The only difference is, that in an individual this process occurs from the time he is a 50 millimeter embryo up to puberty. If during this period a bilateral separate neural arch is present, the possibilities of a forward displacement should be very great. Especially at the level of the fifth lumbar vertebra, the point of connection between a movable and immovable spinal segment.

CONCLUSIONS

1. In cases of painful spondylolisthesis a complete relief of the symptoms was obtained in 41.1 per cent of the patients treated conservatively and in 69.2 per cent of the cases treated by spinal fusion.

2. In no instance was a definite progression of the deformity observed, after the treatment by means of braces or posterior spinal fusion had been undertaken.

3. Surgical procedures that endanger the life of the patient are not justified either from the view of the relief of symptoms, or in order to check the progression of the deformity.

4. The presence of a sciatic pain associated to the local spinal symptoms does not necessarily mean that permanent relief can not be obtained unless the disc is removed or curetted. In 55.5 per cent of the cases presenting such a clinical picture, complete relief was obtained either by conservative means or after the fusion of the posterior spine.

5. In advanced cases of spondylolisthesis the spontaneous fusion of the anterior spine after destruction of the intervertebral disc, did not constantly produce complete relief of the symptoms. On the other hand, following the application of a spinal support or the surgical fusion of the posterior spine, all the symptoms disappeared.

REFERENCES

1. Albee, Fred H. J. Bone Surg., 1927, 9: 427.
2. Azema, Marc Antonin. Thèse de doct., Paris: Jouve et Cie, 1932.
3. Bardeen, C. R. Am. J. Anat., 1905, 4: 265.
4. Idem. In Keibel, F., and Mall, F. Manual of Human Embryology. P. 292. Philadelphia: J. B. Lippincott Co., 1912.
5. Batts, Martin. J. Bone Surg., 1939, 21: 879.
6. Boule, Marcellin. Les hommes fossiles; elements de paleontologie humaine. Paris: Masson et Cie, 1923.
7. Brailsford, J. F. Brit. J. Surg., 1929, 16: 562.
8. Idem. The Radiology of Bones and Joints. 3d ed. London: Churchill, 1944.
9. Burckhardt. Zbl. Chir., 1930, 57: 37.
10. Burns, B. H. Lancet, Lond., 1933, 1: 1233.
11. Caldwell, Guy A. Ann. Surg., 1944, 119: 485.
12. Capener, Norman. Brit. J. Surg., 1931, 19: 374.
13. Carey, Eben J. Radiology, 1943, 41: 554.
14. Chandler, Fremont. Surg. Gyn. Obst., 1931, 53: 273.
15. Congdon, Russell T. J. Bone Surg., 1932, 14: 511.
16. Cunningham, D. J. J. Anat. Physiol., 1889, 24: 117.
17. Dandy, Walter F. J. Am. M. Ass., 1945, 127: 137.
18. Desfosses, and Colleu. Rev. orthop., Par., 1925, 12: 15.
19. Ferguson, Albert B. Radiology, 1934, 22: 548.
20. Idem. Roentgen Diagnosis of the Extremities and Spine. New York: Paul B. Hoeber, Inc., 1939.
21. Friberg, Sten. Acta chir. scand., 1939, 55: 1.
22. Glorieux, Pierre, and Roederer, C. La spondylolyse et ses consequences. Paris: Masson et Cie, 1937.
23. Guilleminet, M. Rev. orthp., Par., 1935, 22: 778.
24. Hitchcock, H. H. J. Bone Surg., 1940, 22: 1.
25. Jenkins, James A. Brit. J. Surg., 1936, 24: 80.
26. Johnson, R. W. Jr. J. Bone Surg., 1934, 16: 867.
27. Julitz. Quoted by Glorieux and Roederer.
28. Junghanns, H. Arch. orthop. Unfall. chir., 1931, 29: 118.
29. Keith, Arthur. Brit. M. J., 1923, 1: 499, 624.
30. Kellog, Speed. Arch. Surg., 1938, 37: 175.
31. Lance and Aurrousseau. Quoted by Mathieu and Demirleau.
32. Lane, A. W. Lancet, Lond., 1893, 1: 991.
33. Lippens, Adrien. Presse méd., 1934, 31: 623.
34. Mathieu, P., and Demirleau. Rev. orthop., Par., 1936, 23: 352.
35. Mercer, Walter. Edinburgh M. J., 1936, 43: 545.
36. Idem. Am. J. Surg., 1939, 43: 367.
37. Meyerding, H. W. J. Bone Surg., 1931, 13: 39.
38. Idem. J. Am. M. Ass., 1938, 3: 1971.
39. Mitchell, G. A. G. J. Bone Surg., 1934, 16: 233.
40. Morton, Dudley J. J. Morph. Physiol., 1926, 43: 147.
41. Mouchet, Albert. Rev. orthop., Par., 1935, 22: 97.
42. Mouchet, A., and Roederer, C. Rev. orthop., Par., 1927, 14: 461.
43. Neugebauer. Quoted by Hitchcock (24).
44. Putschar, W. Arch. Path., Chic., 1937, 24: 270.

45. RAMBAUD, and RENAULT. Quoted by Hitchcock (24).
46. SALMON, M., and CONTIADES, X. J. Rev. orthop., Par., 1933, 20: 193.
47. SCHMORL, G., and JUNGHANNS, H. Die gesunde und kranke Wirbelsäule im Röntgenbild. Leipzig: Georg Thieme, 1932.
48. SICARD, M. M., HAGUENAU, and WALLICH. Rev. neur., Par., 1928, 35: 593.
49. SISEFSKY, M. Acta orthop. scand., 1933, 4: 234.
50. SMITH, ALAN DE FOREST. J. Bone Surg., 1934, 16: 877.
51. STEINDLER, A. J. Bone Surg., 1940, 22: 28.
52. Idem. Orthopedic Operations. Springfield, Illinois: Charles C Thomas, 1943.
53. Idem. Mechanics of Normal and Pathological Locomotion in Man. Springfield, Illinois: Charles C Thomas, 1935.
54. STEWART, T. D. J. Bone Surg., 1935, 17: 640.
55. TURNER, W. Report of the scientific result of the Voyage of H. M. S. Challenger, 1886, 16: 68.
56. WILLIS, THEODORE A. Am. J. Anat., 1923, 32: 95.
57. Idem. J. Bone Surg., 1931, 13: 709.
58. Ibid., 1935, 17: 347.
59. Idem. J. Am. M. Ass., 1944, 125: 407.
60. WOOD JONES, F. Man's Place among the Mammals. London: Arnold and Co., 1929.
61. ZAHRADNICEK. Quoted by Glorieux and Roederer (22).

FUNCTIONAL RESTORATION OF THE THUMB

Pollicization of the Index

H. KELIKIAN, M.D., F.A.C.S., Chicago, Illinois, and E. W. BINTCLIFFE, M.S., F.R.C.S.

DURING the second World War we saw a number of injured hands with the thumb partially or completely ablated. The loss of the thumb deprives the hand of most of its usefulness. The palm can still be used as a paddle and the remaining fingers may serve as hooks. The fingers can by themselves curl around a bar, pluck a chord, scratch, press down, and pinch sideways. Without the thumb, the fingers cannot effectively hold a pen and wield it with skill and speed; the hand as a whole cannot grasp a tool and put it through efficient, gainful work. Torque as used in turning a door knob or a screw driver becomes difficult; pulp-to-pulp pinch, or opposition, is lost.

Modern war missiles, especially high explosives, are extremely destructive. Their action is not selective. It is mangling, mixed. They destroy all the structures in their way, shatter the bones and tear the soft tissues into shreds. Not only the thumb is injured, but the other fingers, usually the index and its metacarpal, are involved. Infections of varying severity intervene and add their toll of destruction. It takes time and numerous coordinated attempts to salvage a thumb out of this havoc, or reconstruct one when it has already been amputated. It is, of course, desirable that the reconstructed thumb be

From the Department of Bone and Joint Surgery of Northwestern University Medical School, Wesley Memorial and Cook County Hospitals, Chicago, and Ronkswood Hospital of the Ministry of Pensions, Worcester, England.

Submitted to publication by the permission of Sir Walter Haward, Director General of Ministry of Pensions.

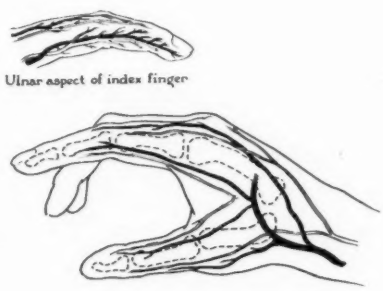


Fig. 1.

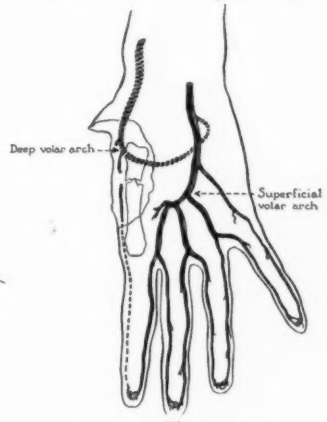


Fig. 2.

Figs. 1 and 2. The surgical anatomy of the ablated thumb with compound fracture of the second metacarpal bone of the hand as caused by gunshot.

Fig. 1. The vessels supplying the thumb and the radial side of the index arise mainly from the radial artery and its continuation, the deep palmar arch. The volar digital artery supplying the radial aspect of the index runs in a dorsal plane closer to the bone; it does not cross the corresponding digital nerve as does the artery on the ulnar aspect of the index (shown in the inset).

Fig. 2. A missile which tears the thumb off and shatters the second metacarpal bone of the hand often severs the volar digital artery which supplies the radial aspect of the index. The digital artery destined to supply the ulnar aspect of the index and emanating mainly from the superficial palmar arch is not involved. The preservation of this artery and its accompanying nerve constitutes the crux of the problem.

Fig. 3.

Fig. 4.

Figs. 3 to 18. The pattern of management as exemplified by Case 1. Donald C. Disarticulation of the right thumb at the carpometacarpal junction and compound fracture of the base of the second metacarpal bone.

Fig. 3. Roentgenogram of the hand.

Fig. 4. Photograph of the hand against the background of the abdominal wall from which a tube graft has been raised. Note the extensive wound which encroaches upon both dorsal and volar surfaces of the hand. Only a small tag of skin is left from the ablated thumb.

Fig. 5. Dorsal incision to deepen the web space between the index and long fingers. Junctura tendinum is shown cut.

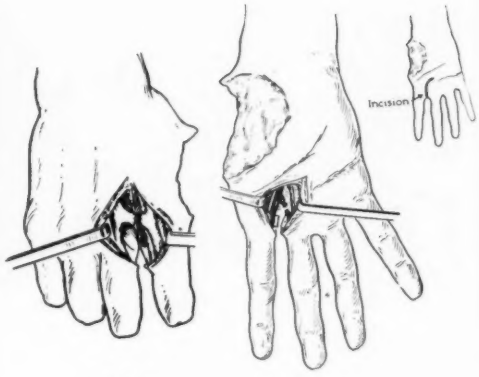


Fig. 5. Fig. 6.

Fig. 6. Volar incision is deepened by severing the transverse fibers of the palmar aponeurosis. The artery which is destined to supply the radial aspect of the long finger is ligated and cut beyond the bifurcation of the mother trunk. The digital nerves are left undisturbed. The deep or transverse metacarpal ligament is cut, volar and dorsal incisions are joined. Index finger is abducted from the remaining fingers.

painless. It must move in and out of oppositional position: abduct, flex and touch the other finger tips. It must feel or at least distinguish between hot and cold and convey some awareness of shape and position. In many cases that came to our attention primary wound excisions had already been performed in other stations and we often did not know how conserving, yet complete, the initial surgery had been. Military exigencies forced us in turn to evacuate soldiers whom we had begun treating. The follow-up was difficult. We did, however, carry on the work on a number of injured thumbs and complet-

Fig. 7.

Fig. 8.

Fig. 7. The surgical wound between the index and long finger is covered with one end of the previously prepared abdominal tube; the fingers are kept apart with a spreader-splint which is bound to the torso with adhesive tape passing around an attached tongue depressor. The spreader-splint consists of a catheter which is sutured to the finger nails of abducted index and of long fingers. It is made stiff by a Kirschner wire.

Fig. 8. When it is ascertained (6 weeks later) that the tube receives sufficient blood from the hand, its other end is released from the abdomen. The tube is opened, trimmed, and made to cover the original wound of the hand and replace the scar-bound skin of the palm.

Fig. 9.

Fig. 10.

Fig. 9. Dorsal view of the hand with all wounds covered and suture lines healed.

Fig. 10. Roentgenogram of the hand showing the faulty union of the abducted distal fragment of the second metacarpal bone.

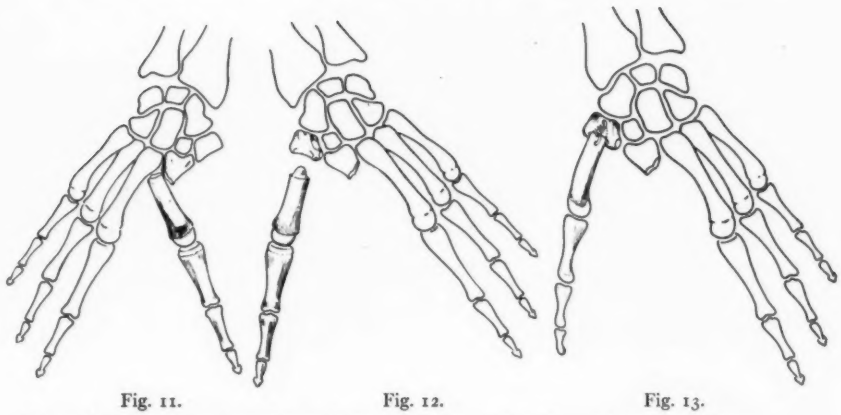


Fig. 11. Fig. 12. Fig. 13.

Fig. 11. Osteotomy is performed through the site of faulty union of second metacarpal bone.
Fig. 12. The osteotomized proximal end of the distal fragment of the second metacarpal bone is coned; a cavity is gouged into the distal surface of the greater multangular bone.
Fig. 13. The coned end of the metacarpal of the index is levered into the cavity of the multangular bone. Wire suture is passed to hold the two bones together. The long abductor of the thumb is anchored to the metacarpal of the index. (This part not shown.)

ed the job of reconstruction. It is hoped that a survey of what was done—of the various steps taken—in transferring the index finger to take the place of the missing thumb would not be amiss.

Two representative cases are here essayed.[1] In one the thumb had been disarticulated completely at the carpometacarpal junction and the second metacarpal bone of the hand was fractured at its base; in the other the thumb was disjointed through the metacarpophalangeal joint and the distal end of the second metacarpal bone had suffered a compound fracture. Both patients were seen by us within 10 days of the original gunshot injury. They were sent to us with the damaged hand enclosed in circular plaster cast. Upon removal of the latter, further examination revealed that in addition to the missing thumb, the second metacarpal bone of the hand had suffered a compound comminuted fracture; the extensor tendons of the index finger were severed but the flexors functioned; finally, the sensibility of the index finger was dulled along its radial aspect but remained intact on the ulnar side. From these findings and from the extent of the wound, it seemed safe to surmise that the artery emanating from the deep volar arch and destined to supply the radial side of the index finger was probably severed; a similar fate perhaps betook the smaller dorsal twigs which accompany the digital branches

[1]Both patients with their reconstructed thumbs were presented at the annual meeting of the British Orthopedic Association at the Royal College of Surgeons, October 26-27, 1945.

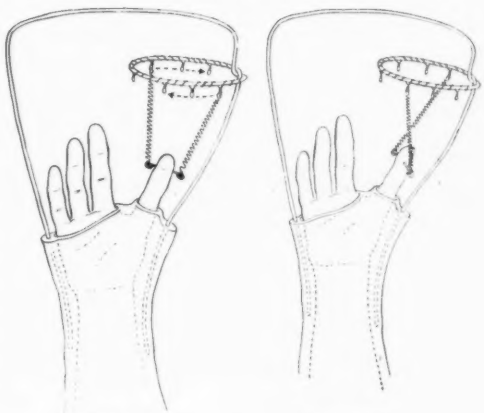


Fig. 14. Fig. 15.

Fig. 14. Kirschner wire is passed through the distal phalanx of the transposed index and is attached to the rotation splint incorporated in a cast.
Fig. 15. The index is gradually rotated into oppositional position in the ensuing 2 weeks before hard callus could deposit. Too hasty rotation of the index might embarrass its precarious circulation.

Fig. 16.

Fig. 17.

Fig. 18.

Figs. 16 to 18. Functional recovery in Case 1.
Fig. 16. Abduction.
Fig. 17. Pulp-to-pulp opposition.

Fig. 18. Holding a pencil. When this patient was last heard from, he stated that he was working full time as a mail clerk.

of the radial nerve part-way into the index finger; the only sizable blood vessel that maintained the circulation of the damaged index was the volar digital artery which runs along its ulnar aspect; the nerve which accompanies this artery, a branch of the median, constituted the sole pathway of sensation (Figs. 1 and 2). *The preservation of this artery and nerve became our primary concerns in trying to pollicize the index finger.* The principles of asepsis chemotherapy, wound closure, prevention of contractures, immobilization and elevation and functional exercises were also adhered. The entire management resolved itself into a pattern which will be described as it was applied for the case with more radical ablation of the thumb: that with disarticulation at the carpometacarpal junction (Figs. 3 to 18). The management was altered slightly, curtailed and short-circuited, for the case with disarticulation of the thumb through the metacarpophalangeal joint.

THE PATTERN OF MANAGEMENT

1. Examination and appraisal. The original cast is removed, the wound inspected; the sensation of the index finger and its power to be actively flexed are tested; an x-ray picture of the entire hand is taken. The hand and forearm are then thoroughly washed with soap and water, wrapped in sterile dressings, splinted and elevated.

2. Preparation of a pedicled tube (or flap) and revision of the wound of the hand. The following day, with the patient under general anesthesia, a tube graft (a flap in the milder case) is raised from an appropriate area of the abdomen. The hand wound is then revised all necrotic tissue, foreign particles, detached pieces of bone and blood clot being removed. Hemostasis is procured. The wound is covered with a fine mesh gauze; the hand and the forearm are encased in a skin-snug, well molded cast, the fingers being left free.

A banjo-splint is incorporated in the cast and elastic finger-nail traction is instituted. The limb is elevated. The traction is maintained at night to prevent contracture of the fingers; during wakeful hours it is released and the patient is coaxed actively to flex and extend all undamaged fingers, to flex the index finger against resistance.

3. Deepening the web-space between the index and long fingers. When it is made certain (usually about 4 weeks) that the abdominal tube would obtain sufficient blood from its root farthest away from the damaged hand, the other end is lifted with a sizable flap of skin, bearing a thick pad of fat. Under safe and adequate constriction of the arm (blood pressure

Fig. 19. Fig. 20. Fig. 21.

Figs. 19 to 32. Variations as exemplified by Case 2. Major H. Disarticulation of the left thumb through the metacarpophalangeal joint with compound fracture of the head of the second metacarpal bone.

Fig. 19. Roentgenogram of the hand soon after gunshot injury, before wound excision.

Fig. 20. Roentgenogram of the hand following wound excision.

Fig. 21. Roentgenogram of the hand showing osteosynthesis of the proximal phalanx of the index to the metacarpal of the thumb which was performed at the same time as closure of the hand wound, deepening of the intermetacarpal cleft and covering this with a freshly raised abdominal flap.

cuff) the web space between the index and long fingers is deepened to about 3 centimeters proximally. The skin incision begins over the dorsum of the hand, in the cleft between the second and third metacarpal bones: It is deepened sufficiently to reveal the band connecting the extensor tendons of the index and long fingers. This junctura tendinum is sharply cut through. The incision is then carried across the interdigital web to the volar surface where it runs proximally, past the distal crease of the palm and then curves ulnarward. The volar incision is deepened cutting through the transverse, interlacing fibers of the palmar aponeurosis. The common arterial trunk which bifurcates into digital vessels for the adjacent sides of the index and long fingers is definitely identified. The digital nerves diverge from their trunk more proximally behind the artery: They are left unmolested. The digital artery going to the radial side of the long finger is carefully isolated. It is doubly ligated well beyond the bifurcation of the common trunk and cut between the two ligatures. The deep or transverse metacarpal ligament which binds the adjacent metacarpal heads firmly together is then sought and severed. The distal fragment of the fractured second metacarpal bone, thus freed, can now be abducted radially with the index finger revealing a deep cleft. The latter is bounded on its radial side by the fractured second metacarpal bone and the first volar interosseous muscle; the second dorsal interosseous, the third metacarpal bone and second lumbrical remain on the ulnar aspect of the deepened cleft. The arm constriction is removed (blood pressure cuff is deflated) and all bleeding points are caught and ligated. The deepened web space is covered with the flap of skin at the detached end of the abdominal tube. A catheter, made rigid by passing a Kirschner wire, is sutured to the finger nails of the abducted index and of the long fingers and this spreader-splint is bound to the torso by adhesive tape. Functional exercises are continued. In addition to finger exercises the forearm and elbow are lifted from the belly repeated-

Fig. 22. Fig. 23. Fig. 24.

Fig. 22. The hand wound 1 week after it had been casted and elevated—2 weeks after the gunshot injury—and immediately before surgery. Note that wound extends dorsally cutting across the extensor tendons of the index and overlying sensory nerves; it passes radially across the pathway of the artery and nerve destined to supply the radial aspect of the index finger; the flexor tendons which pursue an oblique course along the ulnar side of the wound were not disturbed.

Fig. 23. Abdominal flap is sutured to the deepened intermetacarpal cleft; the primary wound is closed; finger-nail spreader-splint is anchored to the torso.

Fig. 24. The hand is released from the abdomen and the detached flap is made to replace the scar-bound skin in the region of the distal palm.

ly so as to obviate flexion deformity of the wrist.

4. Release of the hand from the abdomen; covering the original wound; removal of scar-bound skin and its replacement with padded integument. After it has been definitely made certain that the tube graft receives sufficient blood from the end attached to the hand—after 5 to 6 weeks from the preceding procedure—the other end of the tube graft is detached from the abdomen. The original wound of the hand is refreshed; excess granulation and scar-bound skin is excised; hemostasis is procured. The pedicled tube, anchored into the deepened and widened interdigital web space, is slit open. It is trimmed

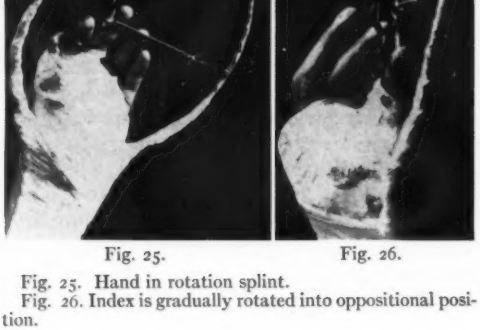


Fig. 25. Fig. 26.

Fig. 25. Hand in rotation splint.

Fig. 26. Index is gradually rotated into oppositional position.

Fig. 27. Fig. 28.

Fig. 27. Hand immobilized in final desired position, with the undamaged fingers and the distal joint of the transposed index left free for exercise.

Fig. 28. Functional exercises are carried through the period of immobilization of the damaged parts.

Fig. 29.

Fig. 30.

Fig. 31.

Fig. 32.

Figs. 29 to 32. The functional recovery of Case 2.
Fig. 29. Abduction.
Fig. 30. Opposition.
Fig. 31. Holding a fork.
Fig. 32. Untying a knot. The last heard, this officer had returned to military duty.

until its cut margins definitely bleed and what is fashioned out of it is made to cover the refreshed hand wound. The limb is then encased in a snug circular cast with the fingers left free. It is elevated. Finger exercises are insisted upon.

5. *Osteosynthesis and rotation of the index finger into a position of opposition.* Another 6 weeks are allowed to lapse. By then the distal fragment of the fractured second metacarpal bone has affected a faulty union. Through a dorsal incision, avoiding the previously placed skin grafts, the second metacarpal bone of the hand is osteotomized at about the level of malunion. The incision is extended to the back of the wrist and to its radial border. The severed tendon of the long abductor of the thumb is now sought and secured with the holding suture. The distal surface of the greater multangular bone is exposed and excavated; the proximal end of the distal fragment of the osteotomized second metacarpal bone is coned and inserted into the cavity already gouged in the greater multangular bone. The two bones are transfixed together with a malleable wire suture. The dissected end of the abductor pollicis longus is anchored to the now transposed distal fragment of the second metacarpal bone. The incision is closed, a Kirschner wire is passed through the distal phalanx of the abducted index and cut short. It is connected to a special rotation splint incorporated in the cast. During the ensuing 2 weeks, before hard callus could deposit, the transposed index finger is gradually rotated in a clockwise direction until it comes to face the long, or preferably the ring, finger. It is then held immobilized in an adequate cast so that all undamaged fingers and the distal joint of the new pollex are left free for exercise.

6. *Functional recovery.* Immobilization is persisted in until firm union has taken place between the two bones: the metacarpal of the index and the greater multangular of the wrist. After the removal of the final cast the patient is coaxed to carry on such co-ordinated useful exercises as holding a pen, a fork, a card. He is encouraged to practice pressing down on a keyboard, grasping a tool and feeding himself. These small feats are easily attained when functional exercises had been carried on throughout the entire management—without the benefit of any special course of re-education.

VARIATIONS AND SHORT-CUTS

While the web space is being widened and deepened, it would have been feasible to have temporarily covered the original wound of the hand with a free split thickness graft. In a case to be reported elsewhere, we raised a separate flap for the hand wound at the time one was anchored to the deepened web space. In the case with disarticulation of the thumb at the metacarpophalangeal joint (Figs. 19 to 32) the edges of the gunshot wound were refreshed and sutured together. At the same sitting the web space between the index and long fingers was deepened; the proximal end of the first phalanx of the index and the distal end of the metacarpal of the thumb were divested of their articular cartilages, apposed, and transfixed together with a wire suture; the deepened web space was covered with a freshly raised abdominal flap and spreader-splint was sutured to the finger nails. After 5 weeks the hand was disconnected from the abdomen and the remnants of the skin flap was utilized to

replace the scar-bound skin on the palm; a short Kirschner wire was passed through the distal phalanx of the transposed index and connected to the rotation splint. When the desired position was attained the rotation splint was replaced by a regular plaster cast immobilizing the new pollex and permitting functional exercises.

COMMENT

The management described has enabled us successfully to transfer the damaged index finger to take the place of the missing thumb. It is to be noted that the cases here assayed presented relatively fresh wounds and compound fractures—wounds caused by gunshot—gaping wounds that were potentially infected. To what extent did chemotherapy contribute to this success would be difficult to say. We did administer sulfa drugs and penicillin in usual doses early in the treatment of wounds and for a few days after each major surgical undertaking. But we relied more on surgical care; on avoidance of added damages; on time and proper splintage to promote healing of the injured structures, and on time alone to enhance adequate vascularization of skin grafts. For the case with complete ablation of the thumb, the management was spread over a period of 7 months. The case with disarticulation at the metacarpophalangeal joint took only 4 months. Long lapses of time did not seem as important as restoring these wounded hands to functional usefulness.

EDITORIAL

SURGERY
Gynecology and Obstetrics

FRANKLIN H. MARTIN
Founder and Managing Editor
1905–1935

LOYAL DAVIS, Editor in Chief

Associate Editors
SUMNER L. KOCH MICHAEL L. MASON
M. E. SPENCER, Assistant Editor

DONALD C. BALFOUR, Associate, Editorial Staff

DECEMBER, 1946

LOBECTOMY AND PNEUMONECTOMY IN THE TREATMENT OF PULMONARY TUBERCULOSIS

SUFFICIENT experience has been accumulated in the past five or six years to make it possible to predict the place that lobectomy and pneumonectomy are likely to have in the surgical treatment of pulmonary tuberculosis. That it would never be possible to excise all of the tuberculous disease in any patient has been obvious from the beginning. Most surgeons have been surprised in the course of their experience by the fact that the disease is frequently found to be more extensive when the chest is opened than the x-ray had led them to believe. Lobectomy or pneumonectomy is not a substitute for any of the forms of collapse therapy and where one of these procedures is likely to prove effective it should be employed in preference to excision. On the other hand, it must be recognized that there are lesions that are unlikely to be controlled by any of the older methods. To state that thoracoplasty is effective in 90 per cent of cases and carries a low mortality is not an argument against lobectomy or pneumonectomy. It is with the types of cases in which thoracoplasty has proved unsatisfactory that the results of the more radical forms of treatment should be compared.

Patients with well marked bronchial stenosis, particularly if repeated febrile attacks occur or if the sputum continues positive in the involved area, should be submitted to lobectomy or pneumonectomy provided the disease in the remainder of the lung is healed or sufficiently quiescent. The operation should not be undertaken if it will necessitate the division of the bronchus through a site of active disease. Areas of tuberculous bronchiectasis which continue a source of positive sputum should be excised. Hemorrhage from such areas in the lower or middle lobes and usually in the upper lobe should be considered an indication for excision, although in the upper lobes thoracoplasty may be the procedure of choice. Atelectatic lobes or portions of lobes which remain the only source of tubercle bacilli should be removed since no other treatment is effective. Cavities which remain open in the presence of what should be an effective pneumothorax ought to be treated by lobectomy if the condition of the remainder of the lung will permit it. In the case of upper lobe cavities of this type it is sometimes wise to do a preliminary thoracoplasty and face the fact that should the sputum remain positive it may be necessary to do a secondary lobectomy. Lobectomy is also indicated in tuberculosis confined to a lower or middle lobe when because of adhesions the disease is not con-

trolled by pneumothorax or phreniclasia. Solitary large tuberculomas should, as a rule, be removed. Such lesions, whether or not collapse therapy has been employed, are prone to undergo necrosis sooner or later, and not infrequently cause dissemination of the disease. That dissemination occurs occasionally in spite of lobectomy is not a valid argument against the procedure, since it will almost certainly happen much less frequently than with any other form of treatment. Massive tuberculous disease in one lung when the lung on the other side is in good condition may occasionally be an indication for pneumonectomy, but this is a doubtful indication and the percentage of satisfactory results is likely to be disappointing.

The long term results of these procedures, as in other forms of surgical treatment, are certain to be influenced by the postoperative management. Prolonged rest is indicated for all cases, particularly if there has been evidence of activation of apparently quiescent pre-existing lesions. Although activity may be permitted fairly early following excision of certain unusually localized foci of disease the management should in general be much the same as though the patient had had a thoracoplasty. Many patients continue to have positive cultures from sputum or gastric lavage for some months following operation. In many such patients the source of the positive sputum is not apparent.

Lobectomy and pneumonectomy undoubtedly have a place, although a limited one, in the surgical management of tuberculosis. Too much enthusiasm unquestionably has resulted in the employment of these procedures in unsuitable cases. Fortunately it is in those cases in which the indication is most obvious that the results are most satisfactory. Lobectomy and pneumonectomy represent additions to the many forms of surgical care of tuberculosis, and time and experience alone will determine the lesions for which they are most suitable.

ROBERT M. JANES.

THE SURGEON'S LIBRARY

REVIEWS OF NEW BOOKS

IN his book entitled *Pneumoperitoneum Treatment*[1], Dr. Banyai has presented the subject so thoroughly that it should no longer be considered a therapeutic fad. Although a voluminous literature has been published on various phases of the subject, this is the first comprehensive monograph. The author, a pioneer himself in the use of pneumoperitoneum, recapitulates the literature and reports on his own experience.

After giving the history of the development of pneumoperitoneum treatment, he devotes a considerable amount of space to discussing the technique. However, it was difficult to decide which of the various methods described was the one of choice.

A very complete discussion of the physical and physiological changes produced by pneumoperitoneum, and of the complications encountered in its therapeutic use, furnishes the background for the clinical application of the procedure.

As the author presents the various diseases and pathological conditions for which pneumoperitoneum has been used, he discusses the fundamental processes involved and the apparent manner in which the pneumoperitoneum works.

Pneumoperitoneum has been used for a long time in the treatment of tuberculous peritonitis and enterocolitis and in general has been effective. The types of the disease suitable for it are clearly described.

Its use in the treatment of pulmonary tuberculosis has been the subject of the greatest amount of discussion and of heated differences of opinion. The largest section of the book is devoted to this field and the author summarizes the extensive literature and draws on his own large experience to formulate his conclusions. That pneumoperitoneum is of value in the treatment of certain cases has been established and that it should not be used to the exclusion of all other forms of treatment is a statement that all will accept. As a result of this chapter alone, Dr. Banyai should succeed in convincing everyone that pneumoperitoneum is a method of treatment which should be a part of the armamentarium of everyone treating pulmonary tuberculosis.

Although most physicians are familiar with the use of pneumoperitoneum in the treatment of pulmonary tuberculosis, few realize that it has also been used quite extensively in the treatment of a wide variety of other chest conditions. These other indications for its use are discussed thoroughly, and a clear presentation of the pathological state in each instance is followed by a summary of the results to be expected and of those obtained. Of particular interest is the discussion of the use of pneumoperitoneum in certain cases of bronchial asthma and of pulmonary emphysema.

In this book Dr. Banyai has succeeded in presenting a very controversial subject in a well balanced and comprehensive manner. No longer should pneumoperitoneum be considered a therapeutic fad. Although the book would be improved by a more complete digest and arrangement of the literature and by the routine use of a summary at the end of each chapter, it is recommended to everyone interested in the treatment of chest disease.

RICHARD H. MEADE, JR.

THE second edition of Saphir's *Autopsy Diagnosis and Technic*[2] hews to the line in its purpose of providing a handbook of autopsy technic and morbid anatomy for the student. The general practitioner and the general pathologist are not beyond the realm of its usefulness. There are 375 pages divided into 26 chapters. Sixty-nine illustrations and 18 tables are helpful accompaniments of the subject matter.

The reviewer heartily endorses the author's idea of the protocol, in Chapter II, page 25. "Too often, autopsy protocols are so packed with irrelevant detail that the reader has difficulty in his attempt to glean the pertinent data from the maze of words offered by the writer."

Religious prejudices to examination of the body after death are adequately disposed of, at least in theory. Unexpected death from natural causes and notes on accidental death are given excellent coverage for the space allotted. The general necropsy technic is treated in a methodical and cogent style.

The student will find the various tables on the differential diagnosis of the morbid processes affecting the major organs of extreme value. Rich's table on the pathogenesis of forms of jaundice has been incorporated to aid the student in the modern interpretation of jaundice, its pathogenesis and concomitant morbid changes. Special attention also has been given to neonatal pathology.

Additions to the text in the second edition are the anatomic changes found in association with certain vitamin deficiencies and tropical diseases. This compact manual well serves its purpose within the limits of its scope.

EUSTACE L. BENJAMIN.

[1] PNEUMOPERITONEUM TREATMENT. By Andrew Ladislaus Banyai, M.D., F.A.C.P., F.C.C.P. St. Louis: The C. V. Mosby Co., 1946.

[2] AUTOPSY DIAGNOSIS AND TECHNIC. By Otto Saphir, M.D. With a foreword by Ludvig Hektoen, M.D. 2d rev. ed. New York: Paul B. Hoeber, Inc., 1946.

THE book by Collens and Boas entitled *The Modern Treatment of Diabetes Mellitus*[1] was designed as a practical, comprehensive guide for the general practitioner who treats diabetic patients, and particularly for those who have not available the services of a competent dietitian. The principles underlying the selection of a suitable dietary formula are explained. The formula decided, the physician (or the patient) can translate it into a menu by copying from the diet calculator supplied with the book. This calculator, about which the chapters on feeding are built, has the merit of simplicity and is one method of prescribing meals with accuracy if not always in good balance or to the satisfaction of the patient. There seems little question but that a trained dietitian can serve the individual patient better and without the need of a calculator at her elbow. Included are chapters on the technique of insulin administration and urine examination, which might well be printed in pamphlet form for the use of the patient.

This book has great value in presenting in clear and readable form material that is seldom presented simply. The procedures of the authors, based on large clinical experience, are definite and logical even as regards controversial details and are, therefore, bound to be helpful to the reader. Commendable, and in line with modern practice, is their emphasis on the efficacy of measured rather than weighed quantitative diets, their emphasis on simplifying instruction, and their selection of formulas that approach as nearly as possible the normal diet.

Clinical differentiation as regards treatment includes the following types: mild diabetes in individuals who are obese, undernourished, and of normal weight; diabetes of moderate severity; and severe diabetes without ketosis, with ketosis, and with uncompensated ketosis. Short chapters on diabetes in children and in pregnancy are included. The chapter on the history of the disease is excellent. The associated degenerative arterial changes of diabetes receive extensive discussion; those of the peripheral arteries are presented at such length that the subject of their treatment merits mention on the title page. The authors have achieved the aims set forth in the preface of their book. Students and physicians will profit by reading and studying it.

WALTER H. NADLER.

THE previous volumes by Saegesser on surgical operative technique and infections of the hand have already served to introduce this Swiss surgeon to the American profession. For many years first assistant to de Quervain, Saegesser has been brought up in the best of European surgical tradition in training and clinical experience. As teacher of clinical surgery with particular interest in the practical problems of surgical technique and therapeusis Saegesser presents his material clearly, methodically, and logically. *Spezielle Chirurgische Therapie für Studierende und Ärtze*[2] is distinctly more than a book on operative technique. He has noted in the preface the questions he wishes to answer: first, what to do in a certain situation; and, second, how best to do it. These questions he has tried to answer "in simple and understandable fashion . . . without learned frills . . . with the idea that in this way the value of the book would not suffer but rather would be increased."

The volume covers the entire field of general surgery omitting brain tumors, plastic surgery, eye, ear, nose and throat surgery, but it does include sizable chapters on urologic surgery, surgery of the bones and joints including maxillofacial fractures, and compression fractures of the spine as well as a special chapter on cord compression. While this is essentially a treatise on therapy and operative indications and technique, many topics considered are accompanied by succinct discussions of diagnosis, differential diagnosis, preoperative and postoperative care, and gross pathology. In the 270 pages devoted to abdominal surgery, for example, one is very much impressed by the space devoted to preparation of the patient for operation and the discussion of methods for preventing and managing complications postoperatively. The book presents those procedures which Saegesser has found best, for while he admits there are often many ways of doing things in surgery one method is usually the best. The reader is not confused with a wide choice of procedures but is presented with a logical uniform approach to surgery.

There are several places where Saegesser's practice and current American practice differ. One is struck by the absence of reference to preparation in large bowel surgery with the sulfonamides; water and electrolyte balance, protein metabolism and vitamin administration are not stressed as they would be in current American texts. The use of suction in abdominal surgery does not seem to be as much appreciated in Switzerland as it is here. The chapter on burns is quite sketchy and seems particularly incomplete in view of British and American contributions in the past ten years.

These criticisms, however, are of minor significance when the volume is considered as a whole. The subject matter is presented in the fashion such as only a trained teacher can present it and the book will serve as a standard for many years. The nearly two thousand line drawing illustrations are excellently done and add greatly to the value of the text. The volume is well worth reading by the student, the general surgeon, and especially by the teacher of surgery.

MICHAEL L. MASON.

THE small volume *Human Torulosis*[3] by Leonard B. Cox and Jean C. Tolhurst is a concentrated treatise on the historical, clinical, and experimental aspects of the Torula histolytica. The authors point

[1] THE MODERN TREATMENT OF DIABETES MELLITUS; INCLUDING PRACTICAL PROCEDURES AND PRECAUTIONARY MEASURES. By William S. Collens, B.S., M.D., and Louis C. Boas, A.B., M.D. Springfield, Illinois: Charles C Thomas, 1946.

[2] SPEZIELLE CHIRURGISCHE THERAPIE FÜR STUDIERENDE UND ÄRTZE. By Max Saegesser. Bern: Hans Huber, 1946.

[3] HUMAN TORULOSIS. By Leonard B. Cox, M.D., and Jean C. Tolhurst, M.Sc. Melbourne: Melbourne University Press, 1946.

out that the cases of infestation of the human body by torula are unquestionably much more common than they are usually supposed to be. Over a hundred cases have been reported (the greatest number being from the United States), and no doubt the disease is still considered rare—which it should no longer be—simply because it is not recognized. No doubt many patients with "tuberculous meningitis" actually have a torular infestation.

The authors present the detailed case histories of 13 patients of their own who suffered from this disease, and from their own series as well as from a comprehensive review of all available reported cases by other authors, show that the central nervous system is the most commonly affected of all the systems of the body and that death most frequently is from that cause. The lung is the next most commonly involved organ, but actually the yeast-like organism may invade and destroy almost any tissue or organ in the body. The most likely portal of entry, they believe, is through the respiratory tract. The common source of the organism is not completely known, though it is to be found in many soils, and it may even be air borne. Neither is it understood how it may pass from individual to individual, if indeed it may. Within the body the torula may pass through the blood or lymph streams, circulate throughout the cerebrospinal fluid system and thence into the perivascular spaces, or it may pass directly into tissues contiguous with a focus. Torulosis in experimental animals closely resembles the human disease in the matter of locus of lesions in the organs of predeliction and in the time element of lesion development.

At present there is no known effective treatment for torular infestation. The drugs of the sulfa group are ineffective, as is penicillin. The salts of some of the heavy metals have been used without result. Some lesions of the lungs apparently heal spontaneously; surgical excision or drainage seems to help effect a cure where such treatment is possible; infestation of the central nervous system is fatal. Many excellent illustrations of the organism and of typical organ lesions are furnished, and as are directions on differential staining of the torula.

JOHN MARTIN.

THE latest member of the series of *General Practice Manuals* is a compact volume[1] designed as an aid to the medical student, the part time anesthetist, and others who may be called upon to employ depressant drugs, alleviate respiratory depression or obstruction, and treat hypoxia or shock. The presentation, therefore, is confined to fundamental and practical considerations of anesthesiology.

In the chapter on preanesthetic medications, a useful table lists the recommended dosage of the various drugs and combinations of drugs for the average patient of the difficult age groups. A particularly timely section is that dealing with the rational treatment of severe drug depression.

No other single factor is as essential to a safe and satisfactory anesthesia as the establishment and maintenance of a perfect airway, and this point has been stressed, as have the undesirable effects resulting from an inadequate airway. Following is a discussion of the common sites of respiratory obstruction and the symptoms of this condition and their alleviation.

The pharmacology of curare and the technique of its use as an adjunct to inhalation anesthesia is presented in some detail. This is a procedure in which the author has pioneered and he is well qualified to speak with authority on this subject.

The four pages of cartoons regarding the correct and incorrect management of toxic reactions of local drugs are clever and instructive.

A number of relatively simple nerve blocks which serve a useful purpose in general practice are presented in some detail. Table 2 shows in graphic forms the essential properties of the drugs used for nerve block and spinal anesthesia.

Moon's valuable diagram of precipitating and perpetuating factors in secondary shock and a chart of physiopathologic changes during the development of shock are useful inclusions in the chapter on the recognition and treatment of shock.

It is emphasized that the recognition of incipient hypoxia and the prompt institution of oxygen therapy are essential factors in the securing of good results. The signs of oxygen want, types of hypoxia, and the physiology of oxygen transport are outlined. The methods of administration of oxygen are illustrated.

An appendix deals, in outline form, with the anesthetic agents available for office use.

The author has achieved his purpose in a clear, concise presentation of the material in this text. No new or controversial concepts have been included, but a comprehensive and instructive manual has been prepared. The volume is well arranged, of attractive format on good stock. It will be of value not only to the student, but to the teacher as well.

MARY POE.

THE book *Urologic Roentgenology* by Miley B. Wesson[2] is an authoritative volume by an outstanding urologist of brilliant scientific background and long clinical experience. The author has drawn upon his own large material as well as that of many others to produce a very fine series of representative roentgenograms which are reproduced with remarkable detail and texture.

The numerous illustrations are an atlas in themselves and in the relatively brief accompanying text the subject of urography is very completely covered. Intravenous as well as retrograde urography is discussed at length, including the indications, technique, and complications.

With the widespread use of intravenous urography too much reliance has been placed upon this procedure alone for diagnosis. The author, therefore,

[1] ANESTHESIA IN GENERAL PRACTICE. By Stuart C. Cullen, M.D. Chicago: The Year Book Publishers, Inc., 1946.

[2] UROLOGIC ROENTGENOLOGY. By Miley B. Wesson, M.D. 2nd rev ed. Philadelphia: Lea & Febiger, 1946.

stresses the need for complete urinary tract studies including retrograde urography to confirm findings.

The technique of interpretation is described at length and the diagnosis is not considered empirically but the underlying pathology and the mechanism of the pyelographic changes are presented.

The material which could well have occupied a much larger volume has been condensed to 252 pages; but thanks to careful editing and skillful writing, it makes for easy and pleasant reading. The chapter on congenital anomalies is especially well presented.

This book, which is intended mainly as a guide for the beginner, can be recommended as well to the experienced urologist, for it contains much practical information. FREDERICK LIEBERTHAL.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

HARVEY CUSHING; A BIOGRAPHY. By John F. Fulton. Springfield: Charles C Thomas, 1946.

OPERATIVE GYNECOLOGY. By Richard W. Te Linde, M.D. Philadelphia, London, Montreal: J. B. Lippincott Co., 1946.

ACIDOSIS; CLINICAL ASPECTS AND TREATMENT WITH ISOTONIC SODIUM BICARBONATE SOLUTION. By Esben Kirk, M.D. Copenhagen, Denmark: Ejnar Munksgaard, 1946.

MEDICAL USES OF SOAP. Edited by Morris Fishbein, M.D. Philadelphia, London, Montreal: J. B. Lippincott Co., 1946.

VICTORY OVER PAIN; A HISTORY OF ANESTHESIA. By Victor Robinson, M.D. New York: Henry Schuman, 1946.

THE CENTENNIAL OF SURGICAL ANESTHESIA; AN ANNOTATED CATALOGUE OF BOOKS AND PAMPHLETS BEARING ON THE EARLY HISTORY OF SURGICAL ANESTHESIA. Compiled by John F. Fulton, M.D., and Madeline E. Stanton, A.B. New York: Henry Schuman, 1946.

MEMOIR ON SULPHURIC ETHER 1847. By W. T. G. Morton. New York: Henry Schuman, 1946.

DISEASES OF THE BASAL GANGLIA AND SUBTHALAMIC NUCLEI. By D. Denny-Brown, M.D., C.H.B., Dr.PHIL., F.R.C.P. Edited by Henry A. Christian, A.M., M.D., LL.D., Sc.D. (Hon.), F.A.C.P., Hon.F.R.C.P. (Can.). (Reprinted from *Oxford Loose-Leaf Medicine* with the same page numbers as in that work.) New York: Oxford University Press, 1946.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

W. EDWARD GALLIE, TORONTO, *President*
IRVIN ABELL, LOUISVILLE, *President-Elect*

Cleveland Committee on Arrangements
THOMAS E. JONES, *Chairman*: JOHN W. HOLLOWAY, *Secretary*

ARTHUR H. BILL
ABRAM B. BRUNER
JOHN F. CORRIGAN
CLARENCE W. ENGLER
SAMUEL O. FREEDLANDER
C. LEE GRABER
JOHN E. HANNIBAL
CARL H. LENHART
OLIVER A. WEBER
THEODORE A. WILLIS

PRELIMINARY PROGRAM FOR THE 1946 CLINICAL CONGRESS IN CLEVELAND—DECEMBER 16 TO 20

THE five-day Clinical Congress of the American College of Surgeons will open in Cleveland on Monday morning, December 16, at 9:30 o'clock. Headquarters will be in the Cleveland Public Auditorium, and the Statler and Cleveland hotels, with most of the sessions, except the clinics at the hospitals, being held in the Auditorium. Outlines of the programs appear on following pages. They show an interesting and varied plan of presenting wartime and postwar developments in surgery through the media of operative and nonoperative clinics, demonstrations, symposia, panel discussions, forums, motion pictures, and exhibits.

The program of the Congress will include the twenty-fifth annual Hospital Standardization Conference, which will convene during the first four days, with morning and afternoon sessions on Monday through Thursday beginning at 9:30 o'clock and 2:00 o'clock, respectively, and evening meetings on Tuesday and Wednesday beginning at 7:30. Breakfast conferences are also scheduled on Wednesday and Thursday mornings.

The first event on the Clinical Congress program will be the General Assembly for surgeons and hospital representatives which will be held on Monday morning. The Monday afternoon program will include two panel discussions, one beginning at 1:30, the other at 3:30; clinics in the local hospitals; a hospital conference; and a surgical film exhibition. The Monday evening program will be devoted to the Presidential Meeting.

On the four mornings beginning Tuesday at 8:00 o'clock, operative and nonoperative clinics will be held in the local hospitals. From 9:00 to 12:30 on each of these mornings, the Forum on Fundamental Surgical Problems will meet in two sections—one section in the Music Hall and the other in the Ballroom of the Cleveland Public Auditorium. From 9:30 to 12:30, Tuesday through Thursday, hospital conferences will be held in Club Room B of the Auditorium. From 9:30 to 11:00 o'clock on Tuesday through Friday, surgical film exhibitions are scheduled on ophthalmology and otorhinolaryngology and from 10:00 to 12:00 o'clock on general surgery. At 11:00 o'clock on Tuesday through Thursday, panel discussions on ophthalmology and otorhinolaryngology will be held.

Afternoon programs each day include clinics; two major panel discussions from 1:30 to 3:00 and from 3:30 to 5:00 o'clock respectively (except Thursday when only the 3:30 panel will be held); hospital conferences (Monday through Thursday); and surgical film exhibitions. In addition, on Tuesday afternoon at 2:00 o'clock there will be a symposium on fractures and other traumas; on Wednesday afternoon at 2:00 o'clock a symposium on cancer; on Thursday afternoon at 3:00 o'clock a panel discussion on graduate training in surgery; and on Friday afternoon six concurrent specialty panels from 2:00 to 5:00 o'clock in the fields of obstetrics, plastic surgery, neurological surgery, thoracic surgery, urology, and orthopedic surgery.

Symposia on general surgery will be held on Tuesday, Wednesday, and Thursday evenings; symposia on ophthalmology and on otorhinolaryngology on Tuesday and Thursday evenings; and

a symposium on plastic surgery of the head and neck on Wednesday evening. The concluding event of the Clinical Congress will be the Convocation to be held on Friday evening at 8:15 o'clock in the Music Hall of the Cleveland Public Auditorium.

CLINICAL PROGRAM

With the aid of a representative in each hospital, a committee on arrangements appointed by the surgeons of Cleveland, with Dr. Thomas E. Jones as chairman and Dr. John W. Holloway as secretary, has prepared a preliminary program which is published in succeeding pages. This consists of operative and nonoperative clinics, demonstrations, presentation of cases, symposia, pathological conferences, and surgical staff conferences.

Eighteen hospitals are listed in this preliminary outline, and the program for each hospital is classified according to specialties. A wide range of subjects is covered, including general surgery, pathology, fractures and other traumas, thoracic surgery, tumor surgery, plastic surgery, ophthalmology, otolaryngology, neurosurgery, vascular surgery, orthopedic surgery, obstetrics and gynecology, genitourinary surgery, oral surgery, and roentgenology.

The clinics and demonstrations will be held in the hospitals every morning and afternoon beginning Tuesday, December 17.

A complete detailed clinical program for each day will be posted in the form of bulletins at headquarters in the Cleveland Public Auditorium during the afternoon of the preceding day and the program will be distributed in printed form each morning.

HOSPITALS AND REPRESENTATIVES

City Hospital	J. H. Lazzari
Cleveland Clinic	Robert S. Dinsmore
Evangelical Deaconess	Oliver A. Weber
Fairview Park Hospital	W. E. Smith
Glenville Hospital	Jacob E. Tuckerman
Grace Hospital	L. J. Sternicki
Huron Road Hospital	Henry W. Brown
Lakeside Hospital	Frederick R. Mautz
Lakewood Hospital	C. Lee Graber
Lutheran Hospital	Frank S. Gibson
MacDonald House	R. L. Faulkner
Mt. Sinai Hospital	Rudolph S. Reich
Polyclinic Hospital	Henry A. Schlink
St. Alexis Hospital	John F. Corrigan
St. Ann's Hospital	E. P. Monaghan
St. John's Hospital	Farrell T. Gallagher
St. Luke's Hospital	Donald M. Glover
St. Vincent Charity	Oliver A. Weber
U. S. Marine Hospital	Mark E. Meyers
U. S. Veterans Hospital	Philip F. Partington
Woman's Hospital	Ernest Cox

GENERAL ASSEMBLY

The Clinical Congress will open with a general assembly in the Music Hall of the Cleveland Public Auditorium at 9:30 o'clock on Monday morning. Dr. W. Edward Gallie, President of the College, will preside at this meeting which will be the opening session of the twenty-fifth annual Hospital Standardization Conference. Dr. Irvin Abell, Chairman of the Board of Regents, will report on the progress of the 1946 Hospital Standardization survey, final results of which, including the Approved Lists of hospitals, cancer clinics, and approved hospitals for graduate training in surgery, will be announced at the end of the year.

An address on "Maintaining our Voluntary Hospital System" will be given by Rev. Monsignor Maurice F. Griffin of Cleveland. Dr. Arthur C. Bachmeyer of Chicago, Director of Study of the Commission on Hospital Care, will present "Pertinent Findings from the National Survey by the Commission on Hospital Care."

The program will conclude with a discussion of the nursing problem. Dr. Howard C. Naffziger of San Francisco, Professor of Surgery, University of California Medical School and Chairman of the Committee on Nursing, American Surgical Association, will present the viewpoint of the surgeon. Dr. Robin C. Buerki of Philadelphia, Director, University Hospitals and Dean of the Graduate School of Medicine, University of Pennsylvania, will present the viewpoint of the hospital administrator. Lucile Petry of Washington, Director of Nursing, United States Public Health Service, will present the viewpoint of the nurse.

PRESIDENTIAL MEETING

The Presidential Meeting will be held on Monday evening in the Music Hall of the Auditorium. The officers, regents, and distinguished guests will participate in the processional. Dr. W. Edward Gallie, President of the College, will preside. The address of welcome will be given by Dr. Thomas E. Jones, Chairman of the Cleveland Committee on Arrangements; distinguished guests will be introduced by Dr. Arthur W. Allen, Vice Chairman, Board of Regents; and Doctor Gallie will deliver the Presidential Address. An inaugural ceremony will be held for the incoming officers: President, Dr. Irvin Abell of Louisville; First Vice President, Dr. Leland S. McKittrick of Boston; Second Vice-President, Dr. F. Phinizy Calhoun of Atlanta.

The first Martin Memorial Lecture will be a feature of the Presidential Meeting this year. Dr. Edward D. Churchill of Boston has accepted the invitation to give this lecture, and his subject will be "The American Surgeon, A. U. S." The lec-

tureship was established upon motion of the Board of Regents at its midyear meeting on April 1, as a memorial to both Dr. Franklin H. Martin and Mrs. Martin. The founder of the College and of SURGERY, GYNECOLOGY AND OBSTETRICS, was joined by his wife in making the College the beneficiary at their deaths of the Journal, together with its physical plant operated by the Surgical Publishing Company of Chicago, of which they were the owners. Doctor Martin died in 1935 and Mrs. Martin in 1945.

The Martin Memorial Lecture, to be given annually during the Clinical Congress, and dealing with a scientific subject of the author's choosing, supplants the Annual Oration in Surgery.

CONVOCATION

The Convocation will be held on Friday evening in the Music Hall. It will open with a processional of officers, regents, governors, and initiates. The President, Dr. Irvin Abell, will preside and will confer the fellowships and the honorary fellowships. Dr. Arthur W. Allen, vice chairman of the Board of Regents, will present the candidates for fellowship.

Several hundred surgeons who have been received into fellowship *in absentia* during the war years in which no Convocation was held, will be added to the number of initiates for the current year who will be present to participate in the initiation ceremonies. The Convocation and in fact the meetings throughout the Congress will be occasions for reunion with many Fellows who have recently returned from service with the military forces.

FORUMS ON FUNDAMENTAL SURGICAL PROBLEMS

The Forums on Fundamental Surgical Problems will be conducted on Tuesday, Wednesday, Thursday, and Friday mornings from 9:00 to 12:30 o'clock, with two sessions held concurrently each morning, one in the Music Hall, the other in the Ballroom. Included in them will be brief reports of original clinical and experimental observations relating to the broad aspects of surgery and the surgical specialties. No prepared discussions of the reports are planned, but questions and comments will be invited. Especially keen interest is expected in these sessions this year because of the accumulation of the results of 5 years of work since the last Clinical Congress. Dr. Owen H. Wangensteen of Minneapolis, chairman of the committee which is planning the program, is working toward representation of as many as possible of the various university departments of surgery in this presentation of clinical and experimental research work.

The enlistment of the interest of young men who are doing original work, through the forums, is one of the most beneficial results of these sessions which are now considered to be an indispensable feature of every Clinical Congress.

GENERAL SURGERY

The evening symposia in general surgery on Tuesday, Wednesday, and Thursday, will be held at 8:00 o'clock in the Music Hall of the Public Auditorium. The subject for Tuesday night is "Care of the Patient Before and After Operation." The subject for Wednesday night is "Venous Thrombosis and Prevention of Pulmonary Embolism," to be followed by the annual Fracture Oration which will be delivered by Dr. Edwin W. Ryerson of Chicago, the subject being "Modern Methods in the Treatment of Fractures." The subject for Thursday night is "Antibiotic and Chemotherapeutic Agents in Surgery."

The subjects for the afternoon panel discussions in general surgery on Monday through Friday afternoons are as follows: "Rehabilitation of the Surgical Patient and Early Ambulation" on Monday at 1:30; "The Treatment of Cancer of the Large Bowel" on Monday at 3:30; "Thiouracil in Thyroid Disease" on Tuesday at 1:30; "Recent Trends in the Management of Carcinoma of the Cervix" on Tuesday at 3:30; "Anesthesia" on Wednesday at 1:30; "Protein Metabolism in the Surgical Patient" on Wednesday at 3:30; "Spinal Cord Injuries" on Thursday at 3:30; "Surgery of the Stomach" on Friday at 1:30; and "Surgery of the Vascular System" on Friday at 3:30.

OPHTHALMOLOGY

The evening symposia in ophthalmology on Tuesday and Thursday will be held at 8:00 o'clock in South Hall B of the Cleveland Public Auditorium. "Orbital Reconstruction Including Prosthesis" will be the subject on Tuesday evening and several subjects will be discussed on Thursday.

Panel discussions on "Retinal Detachment," "Glaucoma," and "Keratoplasty," respectively, are scheduled for Tuesday, Wednesday, and Thursday mornings at 11:00 o'clock.

OTORHINOLARYNGOLOGY

The evening symposia in otorhinolaryngology on Tuesday and Thursday will be held at 8:00 o'clock in South Hall C of the Cleveland Public Auditorium. "Treatment of Deafness" will be the subject on Tuesday evening and "Surgery of the Nasal Accessory Sinuses" on Thursday.

Panel discussions on "The Treatment of Ménière's Disease," "Osteomyelitis of the Skull," and "Rehabilitation of the War Deafened," respectively, are scheduled for Tuesday, Wednesday, and Thursday mornings at 11:00 o'clock.

PLASTIC SURGERY OF THE HEAD AND NECK

A special symposium on plastic surgery of the head and neck will be held on Wednesday evening at 8:00 o'clock in Club Room B. This symposium will be of interest to many general surgeons as well as to ophthalmologists and otorhinolaryngologists. The following subjects will be discussed: "Cancellous Bone Grafts to the Jaw"; "Repair of Nasal Defects with Free Composite Grafts of Skin and Cartilage from the Ear"; "Studies in the Anatomy and the Repair of Cleft Palate"; and "Preservation of Function Following Resections of Jaw Tumors."

SYMPOSIUM ON FRACTURES AND OTHER TRAUMAS

"Advances from War Experience" is the general theme of the symposium on fractures and other traumas which has been arranged by Dr. Robert H. Kennedy of New York, chairman of the Committee on Fractures and Other Traumas of the American College of Surgeons. The aim is to give a rapid survey of worthwhile gains made during the war which may prove of lasting value in the field of trauma. This meeting will be held at 2:00 p.m. on Tuesday in the Ballroom of the Public Auditorium. From the outline shown on a succeeding page it will be seen that an impressive panel of 19 speakers will discuss different phases of the subject and that their presentations will be summarized by Vice Admiral Ross T. McIntire, Surgeon General of the United States Navy; Major General Norman T. Kirk, Surgeon General of the United States Army; and Major General Paul R. Hawley, Chief Medical Director of the United States Veterans Administration.

SYMPOSIUM ON CANCER

A symposium on cancer, sponsored by the Cancer Committee of the College, will be held at 2:00 o'clock on Wednesday afternoon in the Ballroom of the Cleveland Public Auditorium. Dr. Frank E. Adair, chairman of the committee, will preside. The subjects to be discussed are the following: "Surgical Treatment of Cancer of the Pancreas," "Resections of Abdominal Cancer Infiltrating the Abdominal Wall," "Hormone Therapy in Cancer of the Prostate," "Estrogen Therapy in Cancer of the Breast," "Testosterone in Cancer of the Breast"; and "Observations on the Genetic Nature of Gastric Cancer in Mice."

GRADUATE TRAINING IN SURGERY

A panel discussion on graduate training in surgery and the surgical specialties will be held Thursday afternoon at 3:00 o'clock in the Ballroom. Discussion will be from the standpoints of the American College of Surgeons, the basic medical sciences, the Veterans Administration, the university-connected hospital, and the hospital which is not connected with a university.

HOSPITAL STANDARDIZATION CONFERENCE

The twenty-fifth annual Hospital Standardization Conference will open on Monday morning at 9:30 o'clock with the joint session for surgeons and hospital representatives in the Music Hall of the Public Auditorium. The program for this General Assembly has been outlined previously.

The Monday afternoon session will be held in the Ballroom of the Public Auditorium and will consist of a panel discussion on current problems and the immediate outlook in nursing service, conducted by John H. Hayes of New York, President of the American Hospital Association. Among the subjects included will be the following: "Nursing Standards as Affected by Personnel Policies," "Postwar Student Nurse Recruitment Problems," "The Training of a Secondary Group for Nursing Service," and "Nursing Education and Nursing Service."

The Tuesday morning session will be held in Club Room B of the Public Auditorium and will consist of a panel discussion on the securing of complete and scientific medical records. The chairman, Everett W. Jones of Chicago, Vice President of the Modern Hospital Publishing Company, will discuss, "Status of Medical Records in Hospitals as I have Observed Them," following which the program of the American Association of Medical Record Librarians to improve medical record science will be presented. The importance of complete and scientific medical records will then be discussed by different speakers from the standpoints of better care of the patient, training of interns and residents, and the advancement of medical science. The meeting will conclude with a round table conference.

The Tuesday afternoon session in Club Room B will be devoted to a panel discussion on "Extending General Hospital Service to all Types of Patients," with Dr. Herman Smith of Chicago, hospital consultant, presiding. Trends in the care of psychiatric, tuberculous, chronically ill, and orthopedic patients will be discussed by authoritative speakers. The concluding talk will be on "Integration of Health Services in the Community" by Graham L. Davis of Battle Creek,

President-Elect of the American Hospital Association.

Tuesday evening in the Little Theatre of the Cleveland Public Auditorium there will be a joint session for hospital trustees, medical staff officers, and administrators, with Dr. Fred G. Carter of Cleveland presiding.

Wednesday morning at 7:45 a breakfast conference on hospital public relations will be held at the Hotel Statler.

The responsibility of the administrative staff in handling emergencies coming to the hospital and occurring within it will be the subject of a panel discussion on Wednesday morning at 9:30 in Club Room B of the Public Auditorium, which will be conducted by Dr. Frank R. Bradley of St. Louis, Director of Barnes Hospital and President of the American College of Hospital Administrators.

The Wednesday afternoon meeting in Club Room B will consist of a panel discussion on the training of hospital personnel. This will be conducted by Dr. Claude C. Munger of New York, Administrator of St. Luke's Hospital, and Director of the school of hospital administration at Columbia University. Subjects for discussion include the following: "University Training for Hospital Administration"; "Establishing Administrative Internships or Residencies on a High Educational Level"; "Training Supervisory Personnel," and "Training Personnel Managers."

The meeting on Wednesday evening in the Little Theatre of the Public Auditorium will consist of a round table conference on current hospital problems. This will be conducted by Dr. Harvey Agnew of Toronto, Secretary of the Canadian Hospital Council.

The Thursday morning program will begin with a breakfast conference at 7:45 at the Statler Hotel on the subject, "The Point Rating System as Applied to Hospitals," with Dr. Malcolm T. MacEachern presiding. At 9:30 in Club Room B of the Public Auditorium there will be a panel discussion on management techniques and personnel relations conducted by James A. Hamilton of Minneapolis.

The Thursday afternoon program will consist of two sessions. The first, to be held from 2:00 to 5:00 o'clock in Club Room B, will be a panel discussion on problems of the small hospital conducted by Jane Davis of Niles, Michigan, superintendent of Pawating Hospital. The second will be held in the Ballroom from 3:00 to 5:30 o'clock and will be a joint conference of hospital representatives and surgeons on graduate training in surgery and the surgical specialties, with Dr. Robin C. Buerki of Philadelphia.

ASSEMBLY OF INITIATES

The Assembly of Initiates will be held on Friday afternoon in the Ballroom of the Cleveland Public Auditorium. Dr. Irvin Abell, president, will preside. "The Program of the American College of Surgeons" will be discussed by Dr. Malcolm T. MacEachern, Dr. Bowman C. Crowell, and Major General Charles R. Reynolds (Ret.). Dr. Arthur W. Allen, vice chairman, Board of Regents, will speak on "Fellowship in the American College of Surgeons." The program will close with the recital of the fellowship pledge by the initiates.

NATIONAL AND REGIONAL FRACTURE COMMITTEES

The meeting of the National and Regional Fracture Committees, with Dr. Robert H. Kennedy, of New York, chairman of the National Committee, presiding, will be held on Wednesday afternoon in Club Room A of the Cleveland Public Auditorium, when this assembly of surgeons will discuss the activities of the respective groups. Working in co-operation with the American Red Cross, other local organizations and public officials, these committees have exerted great influence in improving methods and facilities for the transportation of the injured. They have also made a concerted effort to improve the treatment of fractures in the hospitals of many communities. Pertinent problems will be discussed at the meeting of these committees.

ANNUAL MEETING OF COMMITTEES

The annual meetings of the State and Provincial Judiciary, Credentials, and Executive Committees will be held on Wednesday morning in the Ballroom of the Hotel Statler. These committees have an important function to perform in the College. The Credentials Committees and the Committees on Applicants constitute one of the largest and most carefully deliberate accrediting bodies which exist in the medical profession. Through this organization the standards of fellowship are maintained and each Fellow of the College has a definite responsibility in this work. All members of these committees are urged to attend this important meeting.

ANNUAL MEETING OF FELLOWS

The annual meeting of the Governors and Fellows will be held on Thursday afternoon at 1:45. There will be election of officers and governors. The annual meeting affords the Fellows of the College an opportunity to hear reports of officials on the work of the organization, and to learn how it has not only raised the professional and ethical

standards of surgery, but has also promoted good hospitalization and general improvement in the practice of medicine in the United States and Canada. Each Fellow has a personal part in this work and may extend the influence of the College materially in his local community. Hospital Standardization alone offers him unlimited opportunity to provide better medical care for his patients in the hospital in which he works, through continuous progress in applying the principles of the Minimum Standard which insure the best care of the patient.

Every Fellow will want to attend this important meeting, at which reports will be presented on finances; Hospital Standardization; Graduate Training in Surgery; Medical Motion Pictures; Publications; Public Relations; Library and Literary Research; the work of the state and provincial credentials committees, committees on applicants, and the Committee on History Reviews; Sectional Meetings, 1946; and the Department of Clinical Research, including cancer clinics, Medical Service in Industry, Cancer Committee, and the Committee on Fractures and other Traumas. Dr. Abell will report on administration of the College, staff changes, and retirements, and Dr. Arthur W. Allen, Vice-Chairman of the Board of Regents will discuss "Fellowship Obligations and Opportunities."

MEDICAL MOTION PICTURES

The latest available films showing surgical procedures and related subjects will be shown in the medical motion picture exhibits which will be held daily. Films on general surgery will be shown in the Little Theatre and films on ophthalmology and otorhinolaryngology in South Hall A of the Cleveland Public Auditorium. These are a much appreciated feature of the Clinical Congress. Despite the decrease in production of such films during the war period, a surprising number of new pictures on varied subjects are being received by the American College of Surgeons for review. Both sound and silent, colored films will be shown, all of which have been approved by the Committee on Medical Motion Pictures.

TECHNICAL AND SCIENTIFIC EXHIBITION

The technical exhibit, together with the registration and clinic ticket bureaus, will be held in the Arena of the Cleveland Public Auditorium. Leading manufacturers of surgical instruments, x-ray apparatus, sterilizers, operating room lights, ligatures, dressings, hospital apparatus and supplies of all kinds, pharmaceuticals, and publishers of medical books will be represented in the exhibition. The technical exhibits will demonstrate many of the newer features learned from our experience in the war.

REGISTRATION

Fellows of the College whose dues are paid to December 31, 1945, initiates of the classes of 1942 through 1946, and Fellows in military service will not be required to pay a registration fee for the Clinical Congress. For endorsed junior candidates the fee is $5.00. Surgeons, not Fellows, who attend as invited guests of the College will pay a registration fee of $10.00.

Although the hospitals of Cleveland afford accommodations for a considerable number of visiting surgeons, attendance at the Congress will be limited to the number that can be comfortably accommodated at the various meetings, as well as by the local hotels. It is anticipated, therefore, that surgeons who are planning to attend the Congress will have registered for the Congress and will also have a confirmed hotel reservation in advance.

HOTEL SITUATION IN CLEVELAND

As a result of the great number of early registrants, practically all of the available hotel space in Cleveland has already been reserved. A number of the Fellows desiring to attend this Congress have been unable to the present time to secure hotel accommodations, and their names have now been placed on a waiting list with the Cleveland Convention Bureau.

The Officers and Regents of the College wish to do all they can to aid in obtaining accommodations for all who want to attend. Arrangements have been made with the Cleveland Convention Bureau to care for a considerable number in private homes in the Cleveland area as well as in the Mayflower and Portage hotels in nearby Akron, which has frequent train and bus service to Cleveland. The average running time of these services from Akron to Cleveland is about one hour, and, if the situation warrants, an effort will be made to provide chartered bus service.

Those who desire to attend this Congress and as yet have been unable to secure a room reservation in Cleveland should write immediately to Mr. Edward C. Brennan, Executive Director, Cleveland Convention Bureau, 511 Tower Building, Cleveland, Ohio. The accommodations desired and the dates of arrival and departure should be given. Information should also be furnished as to whether a reservation in a private home in Cleveland or in an Akron hotel would be acceptable if a reservation in a Cleveland hotel is not available.

CLINICAL CONGRESS PROGRAM IN BRIEF

UNLESS OTHERWISE DESIGNATED, THE MEETING ROOMS LISTED ARE IN THE CLEVELAND PUBLIC AUDITORIUM

Monday

9:30 General Assembly for Surgeons and Hospital Representatives, Music Hall
1:30 Panel Discussion, Music Hall
2:00 Hospital Conference, Ballroom
2:00 Surgical Film Exhibition (General), Little Theatre
3:30–5:00 Panel Discussion, Music Hall
8:15 Presidential Meeting, Music Hall

Tuesday

8:00 Clinics, Demonstrations and Group Conferences, Selected local hospitals
9:00 Forum on Fundamental Surgical Problems, Section A, Music Hall; Section B, Ballroom
9:30 Hospital Conference, Club Room B
9:30 Surgical Film Exhibition (Ophthalmology and Otorhinolaryngology), South Hall A
10:00 Surgical Film Exhibition (General), Little Theatre
11:00 Panel Discussions
Ophthalmology, South Hall B
Otorhinolaryngology, South Hall C
1:30 Panel Discussion, Music Hall
2:00 Clinics, Demonstrations and Group Conferences, Selected local hospitals
2:00 Hospital Conference, Club Room B
2:00 Symposium on Fractures and Other Traumas, Ballroom
2:00 Surgical Film Exhibition (General), Little Theatre
3:30 Panel Discussion, Music Hall
7:00 Surgical Film Exhibition (Ophthalmology and Otorhinolaryngology), South Hall A
7:30 Hospital Conference, Little Theatre
8:00 Symposium, General Surgery, Music Hall
8:00 Symposium, Ophthalmology, South Hall B
8:00 Symposium, Otorhinolaryngology, South Hall C

Wednesday

7:45 Hospital Breakfast Conference, Lattice Room, Hotel Statler
8:00 Meeting of Cancer Committee, Tavern Room, Hotel Statler
8:00 Clinics, Demonstrations and Group Conferences, Selected local hospitals
9:00 Forum on Fundamental Surgical Problems, Section A, Music Hall; Section B, Ballroom
9:30 Hospital Conference, Club Room B
9:30 Surgical Film Exhibition (Ophthalmology and Otorhinolaryngology), South Hall A
10:00 Surgical Film Exhibition (General), Little Theatre

State and Provincial Committees:

9:30 Executive Committees, Ballroom, Hotel Statler
10:15 Credentials Committees and Committees on Applicants, Ballroom, Hotel Statler
11:00 Judiciary Committees, Ballroom, Hotel Statler
11:00 Panel Discussions
Ophthalmology, South Hall B
Otorhinolaryngology, South Hall C
12:00 Meeting of Board of Governors, Lattice Room, Hotel Statler
1:30–3:00 Panel Discussion, Music Hall
2:00 Clinics, Demonstrations and Group Conferences, Selected local hospitals
2:00 Symposium on Cancer, Ballroom
2:00 Surgical Film Exhibition (General), Little Theatre
2:30 Hospital Conference, Club Room B
3:30–5:00 Panel Discussion, Music Hall
3:30 National and Regional Fracture Committees, Club Room A
7:00 Surgical Film Exhibition (Ophthalmology and Otorhinolaryngology), South Hall A
7:30 Hospital Conference, Little Theatre
8:00 Symposium, General Surgery, Music Hall
8:00 Symposium, Plastic Surgery of the Head and Neck, Club Room B

Thursday

7:45 Hospital Breakfast Conference, Lattice Room, Hotel Statler
8:00 Clinics, Demonstrations and Group Conferences, Selected local hospitals
9:00 Forum on Fundamental Surgical Problems, Section A, Music Hall; Section B, Ballroom
9:30 Hospital Conference, Club Room B
9:30 Surgical Film Exhibition (Ophthalmology and Otorhinolaryngology), South Hall A
10:00 Surgical Film Exhibition (General), Little Theatre
11:00 Panel Discussions
Ophthalmology, South Hall B
Otorhinolaryngology, South Hall C
1:30 Adjourned Meeting, Governors, Music Hall
1:45 Annual Meeting, Fellows, Music Hall
2:00 Clinics, Demonstrations and Group Conferences, Selected local hospitals
2:00 Hospital Conference, Club Room B
3:00 Panel Discussion—Graduate Training in Surgery, Ballroom
3:30 Panel Discussion, Music Hall
3:30 Surgical Film Exhibition (General), Little Theatre
4:00 Committee on the Library, Club Room A
7:00 Surgical Film Exhibition (Ophthalmology, and Otorhinolaryngology), South Hall A
8:00 Symposium, General Surgery, Music Hall
8:00 Symposium, Ophthalmology, South Hall B
8:00 Symposium, Otorhinolaryngology, South Hall C

Friday

8:00 Clinics, Demonstrations and Group Conferences, Selected local hospitals
9:00 Forum on Fundamental Surgical Problems, Section A, Music Hall; Section B, Ballroom
9:30 Surgical Film Exhibition (Ophthalmology and Otorhinolaryngology), South Hall A
10:00 Surgical Film Exhibition (General), Little Theatre
1:00 Assembly of Initiates, Ballroom
1:30 Panel Discussion, Surgery of the Stomach, Music Hall
2:00 Clinics, Demonstrations and Group Conferences, Selected local hospitals
2:00 Panel Discussions
Obstetrics, South Hall A
Plastic Surgery, Club Room C
Neurological Surgery, Club Room A
Thoracic Surgery, South Hall B
Urology, South Hall C
Orthopedic Surgery, Club Room B
2:00 Surgical Film Exhibition (General), Little Theatre
3:30 Panel Discussion, Surgery of the Vascular System, Music Hall
8:15 Convocation, Music Hall

GENERAL ASSEMBLY

Monday, 9:30 a.m.—Music Hall, Public Auditorium

Opening Session of Clinical Congress—General Assembly
W. EDWARD GALLIE, M.D., Toronto; President, American College of Surgeons, Presiding.
Preliminary Statement. W. EDWARD GALLIE, M.D., Toronto.
Presentation of Report of Field Activities of the American College of Surgeons for 1946, and Summary of 28 Years of Hospital Standardization.
IRVIN ABELL, M.D., Louisville; Chairman, Board of Regents, American College of Surgeons.
Maintaining our Voluntary Hospital System. Right Reverend Monsignor MAURICE F. GRIFFIN, Cleveland.
Pertinent Findings from the National Survey by the Commission on Hospital Care.
ARTHUR C. BACHMEYER, M.D., Chicago; Director of Study, Commission on Hospital Care; Director, University of Chicago Clinics.
The Nursing Problem:
The Viewpoint of the Surgeon.
HOWARD C. NAFFZIGER, M.D., San Francisco; Professor of Surgery, University of California Medical School; Chairman, Committee on Nursing, American Surgical Association.
The Viewpoint of the Administrator.
ROBIN C. BUERKI, M.D., Philadelphia; Director, University Hospitals and Dean of the Graduate School of Medicine, University of Pennsylvania.
The Viewpoint of the Nurse.
LUCILE PETRY, R.N., Washington; Chief of the Division of Nursing, United States Public Health Service.

PRESIDENTIAL MEETING

Monday, 8:15 p.m.—Music Hall, Public Auditorium

W. EDWARD GALLIE, M.D., Toronto; President, American College of Surgeons, Presiding.
Processional—Officers, Regents and Distinguished Guests.
Invocation.
Rev. BEVERLEY D. TUCKER, D.D., LL.D., Cleveland; Bishop of the Diocese of Ohio.
Address of Welcome.
THOMAS E. JONES, M.D., Cleveland; Chairman, Committee on Arrangements.
Introduction of Distinguished Guests.
ARTHUR W. ALLEN, M.D., Boston; Vice Chairman, Board of Regents.
Address of the Retiring President. Ideals in Surgery.
W. EDWARD GALLIE, M.D., Toronto.
Inauguration of Officers Presented by ALBERT G. FURSTENBERG, M.D., Ann Arbor; Second Vice President.
President: IRVIN ABELL, M.D., Louisville.
First Vice President: LELAND S. MCKITTRICK, M.D., Boston.
Second Vice President: F. PHINIZY CALHOUN, M.D., Atlanta.
The Martin Memorial Lecture. The American Surgeon, A.U.S.
EDWARD D. CHURCHILL, M.D., Boston. John Homans Professor of Surgery, Harvard University.
Recessional.

CONVOCATION

Friday, 8:15 p.m.—Music Hall, Public Auditorium

IRVIN ABELL, M.D., Louisville; President, Presiding.
Processional. Initiates, Officers, Regents and Distinguished Guests.
Invocation.
Right Reverend Monsignor MAURICE F. GRIFFIN, Cleveland.
Conferring of Fellowships by the President.
IRVIN ABELL, M.D., Louisville.
Fellowship Pledge. Recital by the Initiates.
Conferring of Honorary Fellowships. The President.
Fellowship Address. The Education of a Physician.
REUBEN G. GUSTAVSON, Ph.D., Omaha; Chancellor, University of Nebraska.
Recessional.
Reception by the Officers and Regents for the Initiates and Fellows.

EVENING SESSIONS

GENERAL SURGERY

Symposia

Tuesday, 8:00 p.m.—Music Hall, Public Auditorium

IRVIN ABELL, M.D., Louisville; President, American College of Surgeons, Presiding.

Care of the Patient Before and After Operation

Fluid and Electrolyte Balance. CARL H. MOYER, M.D., Dallas.

Nutritional Preparation of the Substandard Risk Patient. RICHARD L. VARCO, M.D., Minneapolis.

Use of Blood and Blood Substitutes. JOHN D. STEWART, M.D., Buffalo.

Blood Transfusion Problems, with Special Reference to the Rh Factor. ALEXANDER S. WIENER, M.D., Brooklyn.

Safe Conduct of the Patient Through Operation. OWEN H. WANGENSTEEN, M.D., Minneapolis.

Wednesday, 8:00 p.m.—Music Hall, Public Auditorium

PAUL B. MAGNUSON, M.D., Chicago; Secretary, American College of Surgeons, Presiding.

Venous Thrombosis and Prevention of Pulmonary Embolism

Interruption of Deep Veins. ARTHUR W. ALLEN, M.D., Boston.

Sympathetic Nerve Block. ALTON OCHSNER, M.D., New Orleans.

Anticoagulants. D. W. GORDON MURRAY, M.D., Toronto.

Fracture Oration

Modern Methods in the Treatment of Fractures. EDWIN W. RYERSON, M.D., Chicago.

Thursday, 8:00 p.m.—Music Hall, Public Auditorium

LELAND S. MCKITTRICK, M.D., Boston; Vice President, American College of Surgeons, Presiding.

Antibiotic and Chemotherapeutic Agents in Surgery

Pathologic Physiology of Surgical Infections. JOHN S. LOCKWOOD, M.D., New Haven.

Penicillin—Its Use in Surgery and Influence on Earlier Types of Chemotherapy. WILLIAM A. ALTEMEIER, M.D., Cincinnati.

Streptomycin. HORTON C. HINSHAW, M.D., Rochester, Minnesota.

Correlation of the Use of Antibiotic and Chemotherapeutic Agents with General Principles of Surgery. S. CHAMP LYONS, M.D., New Orleans.

OPHTHALMOLOGY

Symposia

Tuesday, 8:00 p.m.—South Hall B, Public Auditorium

F. BRUCE FRALICK, M.D., Ann Arbor; Professor of Ophthalmology, University of Michigan Medical School, Presiding.

Orbital Reconstruction Including Prosthesis

Acrylic Prosthesis. A. D. RUEDEMANN, M.D., Cleveland.

A New Type of Basket Implant for use after Enucleation. NORMAN L. CUTLER, M.D., Wilmington.

Reconstruction of Orbital Floor Defects. Major ARTHUR E. SHERMAN, M.C., Fort Dix, New Jersey, Tilton General Hospital.

Reconstruction of the Upper Eyelid. EDMUND B. SPAETH, M.D., Philadelphia.

Thursday, 8:00 p.m.—South Hall B, Public Auditorium

ABRAM B. BRUNER, M.D., Professor of Ophthalmology, Western Reserve University School of Medicine, Presiding.

Applied Anatomy in Eye Surgery. MEYER WIENER, M.D., Coronado.

Visual Disturbances Associated with Head Injuries. JOHN S. MCGAVIC, M.D., Fort Madison.

The Management of Non-Magnetic Intraocular Foreign Bodies. HARVEY E. THORPE, M.D., Pittsburgh.

The Management of Strabismus in Children. MAYNARD C. WHEELER, M.D., New York.

OTORHINOLARYNGOLOGY

Symposia

Tuesday, 8:00 p.m.—South Hall C, Public Auditorium

CARL H. MCCASKEY, M.D., Indianapolis; Member, Advisory Council for Otorhinolaryngology, American College of Surgeons, Presiding.

Treatment of Deafness

The Management of the Chronic Suppurating Ear. JAMES H. MAXWELL, M.D., Ann Arbor.
The Fenestration Operation. GEORGE E. SHAMBAUGH, JR., M.D., Chicago.
The Use of Radium for Conductive Deafness. JOHN E. BORDLEY, M.D., Baltimore.

Thursday, 8:00 p.m.—South Hall C, Public Auditorium

DAVID H. BALLON, M.D., Montreal; Chairman of the Department of Otolaryngology, McGill University Faculty of Medicine, Presiding.

Surgery of the Nasal Accessory Sinuses

Indications for Surgery in the Light of the Use of Antibiotics. HARRY P. SCHENK, M.D., Philadelphia.
Intranasal Surgery. JOHN J. SHEA, M.D., Memphis.
External Operation. FRANCIS L. WEILLE, M.D., Boston.

PLASTIC SURGERY OF THE HEAD AND NECK

Wednesday, 8:00 p.m.—Club Room B, Public Auditorium

Symposium

GORDON B. NEW, M.D., Rochester, Minnesota; Member Advisory Council for Otorhinolaryngology, American College of Surgeons, Presiding.

Cancellous Bone Grafts to the Jaw. TRUMAN G. BLOCKER, M.D., Galveston.
Repair of Nasal Defects with Free Composite Grafts of Skin and Cartilage from the Ear. JAMES B. BROWN, M.D., St. Louis, and Lt. Col. BRADFORD CANNON, M.C., Valley Forge.
Studies in the Anatomy and the Repair of Cleft Palate. GEORGE M. DORRANCE, M.D., Philadelphia.
Preservation of Function Following Resections of Jaw Tumors. LOUIS T. BYARS, M.D., St. Louis, and FRANK MCDOWELL, M.D., St. Louis.

SYMPOSIUM ON FRACTURES AND OTHER TRAUMAS

ADVANCES FROM WAR EXPERIENCE

Tuesday, 2:00 p.m.—Ballroom, Public Auditorium

ROBERT H. KENNEDY, M.D., New York; Chairman, Committee on Fractures and Other Traumas, Presiding.

Shock and Hemorrhage. CHARLES S. RIFE, M.D., Milwaukee.
Burns. Captain H. L. PUGH, M.C., U. S. Navy, Bethesda.
Injuries to the Chest. EARLE B. KAY, M.D., Cleveland.
Injuries to the Genitourinary Tract: Emphasis on Urethral Injuries. GEORGE C. PRATHER, M.D., Boston.
Injuries to the Rectum. EDMUND J. CROCE, M.D., Worcester.
Herniated Nucleus Pulposus. WINCHELL MCK. CRAIG, M.D., Rochester.
Spinal Cord Injuries. DAVID H. POER, M.D., Atlanta.
Peripheral Nerves. BENJAMIN B. WHITCOMB, M.D., Hartford.
Hand Surgery. WILLIAM H. FRACKELTON, M.D., Milwaukee.
Fractures of the Carpal Scaphoids. MATHER CLEVELAND, M.D., New York.
Transportation of Fractures. WILLIAM J. STEWART, M.D., Columbia.
Management of Compound Fractures in Their Early Phases. OSCAR P. HAMPTON, JR., M.D., St. Louis.
Osteomyelitis following Compound Fractures. GROVER C. PENBERTHY, M.D., Detroit.
Replacement of Skin Defects. JAMES B. BROWN, M.D., St. Louis.
Paravertebral Block and Sympathectomy. HARRIS B. SHUMACKER, JR., M.D., New Haven.
Bone Grafts. GEORGE K. CARPENTER, M.D., Nashville.
Amputations. RUFUS H. ALLDREDGE, M.D., New Orleans.

Training of Amputees. HENRY H. KESSLER, M.D., Newark.
Rehabilitation. LT. COL. A. WILLIAM REGGIO, Washington, D.C.
Brief Summary:
MAJOR GENERAL PAUL R. HAWLEY (Ret.), Washington; Chief Medical Director, U.S. Veterans Administration.
VICE ADMIRAL ROSS T. MCINTIRE, Washington; The Surgeon General of the Navy.
MAJOR GENERAL NORMAN T. KIRK, Washington; The Surgeon General of the Army.

SYMPOSIUM ON CANCER

Wednesday, 2:00 p.m.—Ballroom, Public Auditorium

FRANK E. ADAIR, M.D., New York; Chairman, Cancer Committee, American College of Surgeons, Presiding
Surgical Treatment of Cancer of the Pancreas. RICHARD B. CATTELL, M.D., Boston.
Resections of Abdominal Cancer Infiltrating the Abdominal Wall. ALEXANDER BRUNSCHWIG, M.D., Chicago.
Hormone Therapy in Cancer of the Prostate. WILLIAM W. SCOTT, M.D., Baltimore.
Estrogen Therapy in Cancer of the Breast. IRA T. NATHANSON, M.D., Boston.
Testosterone in Cancer of the Breast. FRANK E. ADAIR, M.D., New York.
Observations on the Genetic Nature of Gastric Cancer in Mice. LEONELL C. STRONG, Ph.D., New Haven.

GRADUATE TRAINING IN SURGERY AND THE SURGICAL SPECIALTIES

PANEL DISCUSSION

Thursday, 3:00 p.m.—Ballroom, Public Auditorium

Graduate Training in Surgery and the Surgical Specialties
Moderator: ROBIN C. BUERKI, M.D., Philadelphia
The American College of Surgeons
MAJOR GENERAL CHARLES R. REYNOLDS (Ret.)., Chicago
The Basic Medical Sciences
GEORGE H. MILLER, M.D., Chicago
The Veterans Administration
PAUL B. MAGNUSON, M.D., Washington
The University-Connected Hospital
JOHN R. PAINE, M.D., Minneapolis.
The Hospital Not University-Connected
GEORGE J. CURRY, M.D., Flint

PANEL DISCUSSIONS

GENERAL SURGERY

Monday, 1:30–3:00 p.m.—Music Hall, Public Auditorium

Rehabilitation of the Surgical Patient and Early Ambulation
Moderator: HOWARD RUSK, M.D., New York
Collaborators: I. S. RAVDIN, M.D., Philadelphia
HENRY H. KESSLER, M.D., Newark
JOHN H. POWERS, M.D., Cooperstown

Monday, 3:30–5:00 p.m.—Music Hall, Public Auditorium

The Treatment of Cancer of the Large Bowel
Moderator: FREDERICK A. COLLER, M.D., Ann Arbor
Collaborators: THOMAS E. JONES, M.D., Cleveland
CLAUDE F. DIXON, M.D., Rochester, Minnesota
FRED W. RANKIN, M.D., Lexington

Tuesday, 1:30–3:00 p.m.—Music Hall, Public Auditorium

Thiouracil in Thyroid Disease

Moderator: FRANK LAHEY, M.D., Boston
Collaborators: GEORGE M. CURTIS, M.D., Columbus
WARREN H. COLE, M.D., Chicago
ELMER C. BARTELS, M.D., Boston

Tuesday, 3:30–5:00 p.m.—Music Hall, Public Auditorium

Recent Trends in the Management of Carcinoma of the Cervix

Moderator: JOE V. MEIGS, M.D., Boston
Collaborators: RICHARD W. TELINDE, M.D., Baltimore
CHARLES A. BEHNEY, M.D., Philadelphia
RICHARD DRESSER, M.D., Boston

Wednesday, 1:30–3:00 p.m.—Music Hall, Public Auditorium

Anesthesia

Moderator: HENRY K. BEECHER, M.D., Boston
Collaborators: URBAN H. EVERSOLE, M.D., Boston
LLOYD H. MOUSEL, M.D., Rochester, Minnesota
STUART C. CULLEN, M.D., Iowa City

Wednesday, 3:30–5:00 p.m.—Music Hall, Public Auditorium

Protein Metabolism in the Surgical Patient

Moderator: ROBERT ELMAN, M.D., St. Louis
Collaborators: CHARLES C. LUND, M.D., Boston
PAUL R. CANNON, M.D., Chicago
JOHN H. MULHOLLAND, M.D., New York

Thursday, 3:30–5:00 p.m.—Music Hall, Public Auditorium

Spinal Cord Injuries

Moderator: HOWARD C. NAFFZIGER, M.D., San Francisco
Collaborators: FRANCIS C. GRANT, M.D., Philadelphia
ROBERT H. KENNEDY, M.D., New York
LEWIS J. POLLOCK, M.D., Chicago

Friday, 1:30–3:00 p.m.—Music Hall, Public Auditorium

Surgery of the Stomach

Moderator: ROSCOE R. GRAHAM, M.D., Toronto
Collaborators: G. GAVIN MILLER, M.D., Montreal
LESTER R. DRAGSTEDT, M.D., Chicago
HOWARD K. GRAY, M.D., Rochester, Minnesota

Friday, 3:30–5:00 p.m.—Music Hall, Public Auditorium

Surgery of the Vascular System

Moderator: DANIEL C. ELKIN, M.D., Atlanta
Collaborators: ALFRED BLALOCK, M.D., Baltimore
ARTHUR H. BLAKEMORE, M.D., New York
MICHAEL E. DEBAKEY, M.D., New Orleans

SURGICAL SPECIALTIES

Urology

Friday, 2:00–5:00 p.m.—South Hall C, Public Auditorium

Management of Spinal Cord Bladders

Moderator: HERMAN L. KRETSCHMER, M.D., Chicago
Collaborators: MICHAEL K. O'HEEREN, M.D., Houston. From the Standpoint of the Urologist
PHILIP LEWIN, M.D., Chicago. From the Standpoint of the Orthopedist
FRANK H. MAYFIELD, M.D., Cincinnati. From the Standpoint of the Neurologist
FRANK H. KRUSEN, M.D., Rochester, Minnesota. From the Standpoint of the Physical Therapist

Cancer of the Bladder—An Appraisal of Present Day Methods of Treatment

Moderator: HERMAN L. KRETSCHMER, M.D., Chicago
Collaborators: GERSHOM J. THOMPSON, M.D., Rochester, Minnesota. Conservative Transurethral Treatment of Bladder Tumors
F. H. SQUIRE, M.D., Chicago. Radiation Treatment
CHARLES C. HIGGINS, M.D., Cleveland. Cystectomy with Transplantation of the Ureters to the Bowel or Skin

Neurological Surgery

Friday, 2:00—5:00 p.m.—Club Room A, Public Auditorium

Ruptured Intervertebral Discs

Moderator: FRANCIS C. GRANT, M.D., Philadelphia
Collaborators: WILLIAM P. VANWAGENEN, M.D., Rochester, New York
RUDOLPH JAEGER, M.D., Philadelphia
JAMES L. POPPEN, M.D., Boston

Orthopedic Surgery

Friday, 2:00–5:00 p.m.—Club Room B, Public Auditorium

Intra-Articular Fractures of the Elbow in Childhood and Adult Life

Moderator: CARL E. BADGLEY, M.D., Ann Arbor
Collaborators: PHILIP D. WILSON, M.D., New York
HAROLD B. BOYD, M.D., Memphis
CLAY R. MURRAY, M.D., New York

The Treatment of Club Foot and Its Complications

Moderator: CARL E. BADGLEY, M.D., Ann Arbor
Collaborators: JOSEPH H. KITE, M.D., Atlanta
FRANK R. OBER, M.D., Boston
FRANK E. CURTIS, M.D., Detroit

Plastic Surgery

Friday, 2:00–5:00 p.m.—Club Room C, Public Auditorium

Early Skin Grafting of Burns

Moderator: ROBERT H. IVY, M.D., Philadelphia
Collaborators: JEROME P. WEBSTER, M.D., New York
HARVEY S. ALLEN, M.D., Chicago

Use of Flaps and Grafts in Reconstructive Surgery of the Extremities

Moderator: ROBERT H. IVY, M.D., Philadelphia
Collaborators: Major CARL E. LISCHER, M.C., Valley Forge
Major WILLIAM B. DAVIS, M.C., Valley Forge

Obstetrics

Friday, 2:00–5:00 p.m.—South Hall A, Public Auditorium

Common Problems of the Obstetrician and Pediatrician in Neonatal Morbidity

Moderator: THADDEUS L. MONTGOMERY, M.D., Philadelphia
Collaborators: FREDERICK H. FALLS, M.D., Chicago
WALDO E. NELSON, M.D., Philadelphia

Uterine Inertia

Moderator: THADDEUS L. MONTGOMERY, M.D., Philadelphia
Collaborators: DOUGLAS P. MURPHY, M.D., Philadelphia
FREDERICK H. FALLS, M.D., Chicago

Thoracic Surgery

Friday, 2:00–5:00 p.m.—South Hall B, Public Auditorium

Treatment of Carcinoma of the Esophagus
Lung Resection in Pulmonary Tuberculosis

Moderator: RICHARD H. SWEET, M.D., Boston
Collaborators: JOHN M. GARLOCK, M.D., New York
WILLIAM E. ADAMS, M.D., Chicago
HERBERT C. MAIER, M.D., New York

OPHTHALMOLOGY

Tuesday, 11:00 a.m.—South Hall B, Public Auditorium

Retinal Detachment

Moderator: PAUL A. CHANDLER, M.D., Boston
Collaborators: DONALD W. BOGART, M.D., New York
PETER C. KRONFELD, M.D., Chicago
A. D. RUEDEMANN, M.D., Cleveland

Wednesday, 11:00 a.m.—South Hall B, Public Auditorium

Glaucoma

Moderator: SAMUEL J. MEYER, M.D., Chicago
Collaborators: H. SAUL SUGAR, M.D., Chicago
THOMAS D. ALLEN, M.D., Chicago

Thursday, 11:00 a.m.—South Hall B, Public Auditorium

Keratoplasty

Moderator: R. TOWNLEY PATON, M.D., New York
Collaborators: DERRICK T. VAIL, JR., M.D., Chicago
HERBERT M. KATZIN, M.D., New York
J. WESLEY MCKINNEY, M.D., Memphis

OTORHINOLARYNGOLOGY

Tuesday, 11:00 a.m.—South Hall C, Public Auditorium

The Treatment of Ménière's Disease

Moderator: ALBERT C. FURSTENBERG, M.D., Ann Arbor
Collaborators: KENNETH M. DAY, M.D., Pittsburgh
JOHN R. LINDSAY, M.D., Chicago
THEODORE E. WALSH, M.D., St. Louis

Wednesday, 11:00 a.m.—South Hall C, Public Auditorium

Osteomyelitis of the Skull

Moderator: JOSEPH E. J. KING, M.D., New York
Collaborators: ALBERT C. FURSTENBERG, M.D., Ann Arbor
EDGAR F. FINCHER, M.D., Atlanta

Thursday, 11:00 a.m.—South Hall C, Public Auditorium

Rehabilitation of the War Deafened

Moderator: NORTON CANFIELD, M.D., New Haven
Collaborators: FRANCIS L. LEDERER, M.D., Chicago
RAYMOND CARHART, Ph.D., Evanston
HERBERT KOEPP-BAKER, Ph.D., Chicago
CHARLES E. KINNEY, M.D., Cleveland

FORUM ON FUNDAMENTAL SURGICAL PROBLEMS

Tuesday, 9:00 a. m.—Music Hall, Public Auditorium

WARREN H. COLE, M.D., Chicago, Presiding.

Intestines and Thyroid

Effect of Early Postoperative Rising on the Recurrence Rate of Hernia. JAMES B. BLODGETT, M.D., and EDWARD J. BEATTIE, M.D., Boston. Department of Surgery, Harvard Medical School—Peter Bent Brigham Hospital.

The Relation of Transverse Abdominal Incisions and Early Ambulation to the Reduction of Postoperative Complications. KENNETH F. MACLEAN, M.D., and JAMES THOMPSON, M.D., Ann Arbor. Department of Surgery, University of Michigan Medical School.

A New Method for the Roentgenologic Study of the Rectum. GEORGE LEVENE, M.D., Boston. Surgical Service, Massachusetts Memorial Hospitals, and Department of Surgery, Boston University School of Medicine.

Statistical Analysis—Carcinoma of the Colon. WILLIAM J. VYNALEK, M.D., Berwyn, Illinois. Department of Surgery, Veterans Administration Hospital, Hines; and Department of Surgery, Loyola University School of Medicine.

Reconstruction of the Colon and Rectum Following Battle Wounds. DAVID HENRY POER, M.D., Atlanta. Emory University School of Medicine.

Experiences with the Dragstedt Ileostomy. GEORGE BENTON SANDERS, M.D., Louisville. Surgical Service, Vaughan General Hospital, Hines, Illinois; and Department of Surgery, University of Louisville School of Medicine.

The Role of Infection in Experimental Closed Loop Small Bowel Obstruction. EARLE B. MAHONEY, M.D., JOHN A. SCHILLING, M.D., HARRY D. KINGSLEY, M.D., and WALTER A. GUNKLER, M.D., Rochester, New York. Strong Memorial Hospital.

The Effect of Penicillin in Experimental Intestinal Obstruction. ALEXANDER BLAIN, III, M.D., Ann Arbor. Department of Surgery, University Hospital.

Laboratory and Clinical Experiences with the Use of Streptomycin in the Prophylaxis and Treatment of Infections of Intestinal Origin. HENRY L. SILVANI, M.D., SANFORD ROTHENBERG, M.D., HELEN WARMER, JOYCE AMLUXEN, and H. J. MCCORKLE, M.D., San Francisco. Department of Experimental Surgery, University of California Medical School.

Thiouracil and Surgical Treatment of Hyperthyroidism. JOHN C. SCULLY, M.D., Chicago. Department of Surgery, Northwestern University Medical School.

Thiouracil and Iodine: The Preoperative Management of the Thyrotoxic Patient. BENJAMIN GOLDMAN, M.D., JAMES WEAVER, M.D., and E. M. RALSTON, M.D., Erie, Pennsylvania. Hamot Hospital.

The Necessity for and Methods of Remedying the Disturbances of Calcium and Phosphorus Metabolism in Patients with Toxic Goiter. I. DARIN PUPPEL, M.D., Columbus, Ohio. Department of Research Surgery, Ohio State University College of Medicine.

Tuesday, 9:00 a.m.—Ballroom, Public Auditorium

FREDERICK A. COLLER, M.D., Ann Arbor, Presiding.

Vascular Surgery

Wounds of Common Carotid Arteries. KNOWLES B. LAWRENCE, M.D., Brookline. Surgical Service, Massachusetts Memorial Hospitals; and Department of Surgery, Boston University School of Medicine.

Ligation of the Inferior Vena Cava in Thrombosis of the Deep Veins of the Lower Extremities. J. ROSS VEAL, M.D., Washington, D.C. Georgetown University School of Medicine.

Ligation of the Inferior Vena Cava. WILLIAM R. MOSES, M.D., Washington, D.C. Department of Surgery, George Washington University School of Medicine; and Gallinger Municipal Hospital.

Permanent Intubation Anastomosis of the Thoracic Aorta. CHARLES A. HUFNAGEL, M.D., Boston. Department of Surgery, Harvard Medical School—Peter Bent Brigham Hospital.

The Indications for Portacaval Anastomosis. ARTHUR H. BLAKEMORE, M.D., New York. Department of Surgery, Columbia University College of Physicians and Surgeons.

Abdominal Arteriography. Report of Complete Aortic Block. FREDERICK B. WAGNER, JR., M.D., and ALISON H. PRICE, M.D., Philadelphia. Samuel D. Gross Surgical Division and Medical Department, Jefferson Medical College Hospital.

Frostbite: Functional and Morphologic Pathology and the Prevention of Subsequent Gangrene. KURT LANGE, M.D., DAVID WEINER, M.D., and LINN J. BOYD, M.D., New York. New York Medical College, Flower and Fifth Avenue Hospitals.

The Right Heart Catheterization Technique as Applied to the Investigation of Arteriovenous Fistulas. A Case Study. B. W. HAYNES, JR., M.D., I. A. BIGGER, M.D., and EVERETT IDRIS EVANS, M.D., Richmond. Department of Surgery, Medical College of Virginia.

Sympathectomy as an Adjunct in Surgery of Aneurysms and Arteriovenous Fistulas. HARRIS B. SHUMACKER, JR., M.D., New Haven. New Haven Hospital.

The Use of Prolonged Continuous Spinal Anesthesia to Relieve Vasospasm and Pain in Peripheral Embolism. SCOTT M. SMITH, M.D., and VINCENT L. REES, M.D., Salt Lake City. University of Utah School of Medicine.

Femoral Vein Ligation for Chronic Occlusive Arterial Disease. S. THOMAS GLASSER, M.D., New York. New York Medical College, Flower and Fifth Avenue Hospitals.

The Effects of Altered Blood Flow in Venous Vasa Vasorum upon the Condition of Venous Endothelium, and the Relation of Anoxia of Vein Walls to Intravenous Thrombosis. JAMES F. O'NEILL, M.D., Boston. Department of Physiology, Harvard University School of Public Health.

Wednesday, 9:00 a.m.—Music Hall, Public Auditorium

MICHAEL L. MASON, M.D., Chicago, Presiding.

Wound Healing and Infection

Experiments with Non-irritating Glove Powder. C. MARSHALL LEE, JR., M.D., Charlottesville. Department of Surgery and Gynecology, University of Virginia Department of Medicine.

Magnesiogenous Pneumagranuloma as a Research Tool. CARL W. WALTER, M.D., Boston. Department of Surgery, Harvard Medical School—Peter Bent Brigham Hospital.

Human Hemoglobin as a Vehicle. LIEUTENANT COLONEL FELIX JANSEY, M.C., A.U.S., Hines. Orthopedic Service, Veterans Administration Hospital, and Department of Surgery, Northwestern University Medical School.

Rate of Gain in Strength in Sutured Abdominal Wounds. CLARENCE DENNIS, M.D., JOHN FAST, M.D., and CARLETON NELSON, M.D., Minneapolis. Department of Surgery, University of Minnesota Medical School.

Clostridial Myositis. F. A. SIMEONE, M.D., Boston. Department of Surgery, Harvard Medical School—Massachusetts General Hospital.

Results Following the Pigment Injection (Tattooing) of Port Wine Stains and Skin Grafts. HERBERT CONWAY, M.D., New York. New York Hospital.

A New Operative Treatment of Elephantiasis. EDGAR J. POTH, M.D., and SAM R. BARNES, M.D., Galveston. University of Texas Medical Branch.

Observations on the Volume of the Blood in Patients with Weight Loss. JOHN H. CLARK, M.D., New Orleans. Department of Surgery, Tulane University of Louisiana School of Medicine.

The Estimation of Acute Blood Loss by the Tilt Test. DANIEL GREEN, M.D., and DAVID METHENY, M.D., Seattle. King County Hospital.

Tissue Destruction in the Immediate Postoperative Period. ROBERT L. BERRY, M.D., VIVIAN IOB, Ph.D., and KENNETH N. CAMPBELL, M.D., Ann Arbor. Department of Surgery, University of Michigan Medical School.

The Diagnosis and Treatment of Fat Embolism. J. E. DUNPHY, M.D., FREDERICK ILFELD, M.D., and MAGNUS SMEDAL, M.D., Boston. Department of Surgery, Harvard Medical School—Peter Bent Brigham Hospital.

Wednesday, 9:00 a.m.—Ballroom, Public Auditorium

ALEXANDER BRUNSCHWIG, M.D., Chicago, Presiding.

Liver, Gallbladder, and Pancreas

Intermittent External Biliary Drainage for Relief of Pruritus in Certain Chronic Disorders of the Liver. RICHARD L. VARCO, M.D., Minneapolis. Department of Surgery, University of Minnesota Medical School.

Visualization of Amebic Abscess of the Liver as an Aid to Therapy and Prognosis. HARRY C. HULL, M.D., Baltimore. University of Maryland School of Medicine and College of Physicians and Surgeons.

Experimental Implantations of the Common Bile Duct. TED BINKLEY, M.D., ROBERT PALMER, M.D., and H. J. MCCORKLE, M.D., San Francisco. Department of Experimental Surgery, University of California Medical School.

The Effect of Anemic Anoxia (Hemorrhage) and Anoxic Anoxia on Hepatic Function in Dogs. H. A. DAVIS, M.D., Los Angeles. Department of Surgery, College of Medical Evangelists.

Principles Involved in Surgical Therapy of "Encapsulated" Connective Tissue Malignancies. WALTER W. CARROLL, M.D., Chicago. Department of Surgery, Northwestern University Medical School.

Acute Pancreatitis and Its Sequelae. THOMAS J. ANGLEM, M.D., Boston. Surgical Service, Massachusetts Memorial Hospitals; and Department of Surgery, Boston University School of Medicine.

Acute Pancreatitis: An Experimental Study with Special Reference to X-ray Therapy. TAGUE C. CHISHOLM, M.D., Minneapolis, and ROY E. SEIBEL, M.D., Boston. Department of Surgery, Harvard Medical School—Peter Bent Brigham Hospital.

Radical Pancreatoduodenectomy with Resection of the Patent Portal Vein. PAUL W. SCHAFER, M.D., Kansas City, Kansas. Department of Surgery, University of Kansas School of Medicine.

Pancreatic Reflux Deliberately Produced. HENRY DOUBILET, M.D., New York. New York University College of Medicine.

Care of the Dog with External Pancreatic Fistula. FRED KOLOUCH, M.D., Minneapolis. Department of Surgery, University of Minnesota Medical School.

Thursday, 9:00 a.m.—Music Hall, Public Auditorium

OWEN H. WANGENSTEEN, M.D., Minneapolis, Presiding.

Gastric Surgery

Carcinoma of the Stomach. CLAUDE E. WELCH, M.D., Boston. Department of Surgery, Harvard Medical School—Massachusetts General Hospital.

An Experimental Study of Motility of the Stomach after Vagotomy. RAYMOND W. POSTLETHWAIT, M.D., Durham, North Carolina. Department of Surgery, Duke University School of Medicine.

The Effect of Supradiaphragmatic Vagus Nerve Section in Man. WALTER B. CRANDELL, M.D., WALTER E. BOEHM, M.D., and JOHN H. MULHOLLAND, M.D., New York. New York University College of Medicine.

Complications Observed after Transthoracic Vagotomy for Peptic Ulcer. KEITH S. GRIMSON, M.D., Durham. Department of Surgery, Duke University School of Medicine.

The Condition of Eight Patients Fifteen Months or More After Total Gastrectomy. WILLIAM P. LONGMIRE, JR., M.D., Baltimore. Johns Hopkins University School of Medicine.

Use of Buffered Thrombin in Control of Gastric Hemorrhage. BYRNE M. DALY, M.D., Detroit. Departments of Surgery and Physiology, Wayne University College of Medicine.

The Sippy Regimen Protects Against the Histamine-provoked Ulcer. JOHN FAST, M.D., Minneapolis. Department of Surgery, University of Minnesota Medical School.

Abetting Influence of Hemoconcentration on Ulcer Diathesis. IVAN D. BARONOFSKY, M.D., Minneapolis. Department of Surgery, University of Minnesota Medical School.

Autodigestion and Repair in the Normal and Hyperacid Canine Stomach. PHILIP B. PRICE, M.D., Salt Lake City. Department of Surgery, University of Utah School of Medicine.

Experimental Burns Abet the Ulcer Diathesis. STANLEY R. FRIESEN, M.D., Minneapolis. Department of Surgery, University of Minnesota Medical School.

A New Simplified Intestinal Decompression Tube. MEYER O. CANTOR, M. D., Detroit. Grace Hospital.

Thursday, 9:00 a.m.—Ballroom, Public Auditorium

HOWARD C. NAFFZIGER, M.D., San Francisco, Presiding.

Neurosurgery and Sympathectomy

The Use of Penicillin in Conjunction with Bone Grafting in Experimental Skull Defects. H. J. MCCORKLE, M.D., EDWIN KERR, M.D., SANFORD ROTHENBERG, M.D., and HELEN WARMER, San Francisco. Department of Experimental Surgery, University of California Medical School.

The Localization of Intracranial Tumors by Electroencephalography. R. C. BASSETT, M.D., and B. K. BAGCHI, Ph.D., Ann Arbor. University of Michigan Medical School.

Decerebration in the Traumatized Human: Its Pathogenesis and Management. RUSSELL MEYERS, M.D., Iowa City. State University of Iowa College of Medicine.

The Incidence of Interhemispheric Extension of Glioblastoma Multiforme Through the Corpus Callosum. HARRY P. MAXWELL, M.D., Milwaukee. Department of Surgery, Marquette University School of Medicine.

After-image Perimetry. WILLIAM P. WILLIAMSON, M.D., Kansas City, Kansas. University of Kansas School of Medicine.

Blockade of the Autonomic Ganglia by Tetra-ethyl Ammonium Bromide in Peripheral Vascular Disease and Causalgic States. KENNETH N. CAMPBELL, M.D., ROBERT L. BERRY, M.D., MARTIN R. SUTLER, M.D., RICHARD H. LYONS, M.D., and GORDON K. MOE, M.D., Ann Arbor. Department of Surgery, University of Michigan Medical School.

The Effect of Autonomic Blockade on the Urinary Bladder in Man. JACK LAPIDES, M.D., REED M. NESBIT, M.D., WILLIAM L. VALK, M.D., MARTIN R. SUTLER, M.D., ROBERT L. BERRY, M.D., RICHARD H. LYONS, M.D., KENNETH N. CAMPBELL, M.D., and GORDON K. MOE, M.D., Ann Arbor. Department of Surgery, University of Michigan Medical School.

Lumbar Ganglionectomy in Occlusive Peripheral Vascular Disease. GEORGE H. YEAGER, M.D., Baltimore. University of Maryland School of Medicine and College of Physicians and Surgeons.

Testing Hypertensive Patients Preoperatively. JAMES L. SOUTHWORTH, M.D., Baltimore and HENRY I. RUSSEK, M.D., Staten Island. Surgical Service, United States Marine Hospital, Baltimore, and Cardiovascular Research Unit, United States Marine Hospital, Staten Island.

The Operative and Postoperative Management of Hypertensive Patients Undergoing Thoracolumbar Sympathectomy. JERE W. LORD, JR., M.D., and J. WILLIAM HINTON, M.D., New York. Sympathectomy Clinic, New York Post-Graduate Medical School and Hospital.

Friday, 9:00 a.m.—Music Hall, Public Auditorium

GROVER C. PENBERTHY, M.D., Detroit, Presiding.

Extremities, Bones and Joints, Burns, and Gynecology.

The Present Concepts Concerning the Care of the Burned Patient. WILLIAM E. ABBOTT, M.D., Detroit, and John Winslow Hirshfeld, M.D., Ithaca, New York. Harper Hospital, Detroit.

The Physiological Approach to the Local Treatment of Burns. EDWARD L. HOWES, M.D., and WOLFGANG ACKERMANN, M.D., New York. Columbia University College of Physicians and Surgeons.

Hypocholesterolosis of the Adrenal Glands in Experimental Burns. HENRY N. HARKINS, M.D., Baltimore, Johns Hopkins University School of Medicine.

Disadvantages and Dangers of Refrigeration Anesthesia. KENNETH PEACOCK, M.D., and GUISEPPE D'ANDREA, M.D., New York. New York Medical College, Flower and Fifth Avenue Hospitals.

The Problem of Pain in Amputation Stumps. LOUIS G. HERRMANN, M.D., Cincinnati. University of Cincinnati College of Medicine.

Immobilization of the Injured Hand in Position of Function. HARVEY S. ALLEN, M.D., Chicago. Department of Surgery, Northwestern University Medical School.

Experimental Study of Internal Fixation of Fractures. WILLIAM H. AINSWORTH, M.D., Galveston. Department of Surgery, University of Texas Medical Branch.

Acromioclavicular Separation. A Study of the End Results Obtained with the Screw Method of Repair. BOARDMAN M. BOSWORTH, M.D., New York. New York Hospital.

Musculotendinous Tears of the Shoulder Joint. GEORGE E. WILSON, M.B., Toronto. University of Toronto Faculty of Medicine and St. Michael's Hospital.

Diagnosis of Precancer of the Cervix by Cytology. J. ERNEST AYRE, M.D., Montreal. Gyne-cytology Laboratory, Royal Victoria Hospital; and McGill University Faculty of Medicine.

Modification in Technique of the Manchester Operation for Uterine Prolapse. RALPH E. CAMPBELL, M.D., Madison. University of Wisconsin Medical School.

Extraperitoneal Iliac Lymphadenectomy in the Treatment of Cancer of the Cervix. IRA T. NATHANSON, M.D., Boston. Harvard Medical School—Massachusetts General Hospital, Tumor Clinic, Boston; and Pondville Hospital, Walpole.

Endometriosis of the Gastrointestinal Tract. MARTIN R. SUTLER, M.D., Ann Arbor. Departments of Pathology and Surgery, University of Michigan Medical School.

Friday, 9:00 a.m.—Ballroom, Public Auditorium

CLAUDE S. BECK, M.D., Cleveland, Presiding.

Thorax, Breast, Heart, and Anesthesia

Treatment of Chronic Non-tuberculous Pulmonary Abscesses. HARRY E. NELSON, M.D., Dallas. Southwestern Medical College of the Southwestern Medical Foundation.

Surgical Treatment of Bullous Emphysema. JEROME R. HEAD, M.D., Chicago. Department of Surgery, Northwestern University Medical School.

Anomalies of the Pulmonary Vein. O. C. BRANTIGAN, M.D., Baltimore. University of Maryland School of Medicine and College of Physicians and Surgeons.

Physiological Studies in Congenital Heart Disease. RICHARD J. BING, M.D., and L. D. VANDAM, M.D., Baltimore. Department of Surgery, Johns Hopkins University School of Medicine.

Experimental Aortic Valvulotomy: A Preliminary Report. H. G. SMITHY, M.D., and EDWARD F. PARKER, M.D., Charleston, South Carolina. Department of Surgery, Medical College of the State of South Carolina.

Indications for Simple Mastectomy. DANELY P. SLAUGHTER, M.D., and LAWRENCE W. PETERSON, M.D., Chicago. Tumor Clinic, Research and Educational Hospitals, University of Illinois College of Medicine.

A Clinical Experimental Study of the Uptake of Radioactivated Phosphorus by Tumors of the Breast. B. V. A. LOW-BEER, M.D., H. GLENN BELL, M.D., H. J. MCCORKLE, M.D., and ROBERT S. STONE, M.D., with the assistance of W. B. HILL, M.D., and H. L. STEINBACH, M.D., San Francisco. Divisions of Radiology and Surgery, University of California Medical School.

A New Type of Endobronchial Airway. C. P. BAILEY, M.D., and HENRY S. RUTH, M.D., Philadelphia. Departments of Surgery and Anesthesiology, Hahnemann Medical College and Hospital of Philadelphia.

TWENTY-FIFTH ANNUAL HOSPITAL STANDARDIZATION CONFERENCE

Monday, 9:30 a.m.—Music Hall, Public Auditorium

Opening Session of Clinical Congress—General Assembly
W. EDWARD GALLIE, M.D., Toronto; President, American College of Surgeons, Presiding.
Greetings from the American Hospital Association
JOHN H. HAYES, New York; President
Greetings from the Canadian Hospital Council
HARVEY AGNEW, M.D., Toronto; Secretary
Preliminary Statement. W. EDWARD GALLIE, M.D., Toronto.
Presentation of Report of Field Activities of the American College of Surgeons for 1946, and Summary of 28 Years of Hospital Standardization.
IRVIN ABELL, M.D., Louisville; Chairman, Board of Regents, American College of Surgeons.
Maintaining our Voluntary Hospital System.
RIGHT REVEREND MONSIGNOR MAURICE F. GRIFFIN, Cleveland.
Pertinent Findings from the National Survey by the Commission on Hospital Care.
ARTHUR C. BACHMEYER, M.D., Chicago; Director of Study, Commission on Hospital Care; Director, University of Chicago Clinics.
The Nursing Problem:
The Viewpoint of the Surgeon.
HOWARD C. NAFFZIGER, M.D., San Francisco; Professor of Surgery, University of California Medical School; Chairman, Committee on Nursing, American Surgical Association.
The Viewpoint of the Administrator.
ROBIN C. BUERKI, M.D., Philadelphia; Director, University Hospitals and Dean of the Graduate School of Medicine, University of Pennsylvania.
The Viewpoint of the Nurse.
LUCILE PETRY, R.N., Washington; Chief of the Division of Nursing, United States Public Health Service.

Monday, 2:00 p.m.—Ballroom, Public Auditorium

Panel Discussion on Current Problems and Immediate Future Outlook in Nursing Service.
Conducted by JOHN H. HAYES, New York; President, American Hospital Association, Superintendent, Lenox Hill Hospital.
The Future of Nursing.
JAMES W. STEPHAN, Canton, Ohio; Director, Aultman Hospital.
Nursing Standards as Affected by Personnel Policies.
EDGAR BLAKE, JR., Chicago; Superintendent, Wesley Memorial Hospital.
Postwar Student Nurse Recruitment Problems.
EDITH H. SMITH, Syracuse; Dean of the School of Nursing, Syracuse University.
The Training of a Secondary Group for Nursing Service.
H. LENORE BRADLEY, Albany; Supervisor of Nursing Education, New York Board of Nurse Examiners.
Round Table Conference on Nursing Problems.
Moderator: JAMES W. STEPHAN, Canton.
Collaborators:
PAUL H. FESLER, Oklahoma City; Administrator, University of Oklahoma Hospitals.
LOIS HOLIMAN, R.N., Chicago; Associate Director, Cook County School of Nursing.
CELIA CRANZ, R.N., Akron; Director of Nursing, City Hospital of Akron.
LEE S. LANPHER, Cleveland; Administrator, Lutheran Hospital.
HARVEY AGNEW, M.D., Toronto; Secretary, Canadian Hospital Council.

Tuesday, 9:30 a.m.—Club Room B, Public Auditorium

Panel Discussion—The Securing of Complete and Scientific Medical Records.
Conducted by EVERETT W. JONES, Chicago; Vice-President, The Modern Hospital Publishing Company.
Introductory Remarks by the Chairman—Status of Medical Records in Hospitals as I Have Observed Them.
The Program of the American Association of Medical Record Librarians to Improve Medical Record Science.
EDNA K. HUFFMAN, Chicago; Chief Medical Record Librarian, Wesley Memorial Hospital; Director, Program in Medical Record Library Science, Northwestern University.
The Importance of Complete and Scientific Medical Records from the Standpoints of:
Better Care of the Patient.
GILSON C. ENGEL, M.D., Philadelphia; Associate Professor of Surgery, University of Pennsylvania Graduate School of Medicine.
Self Education of the Practicing Physician.
JOHN R. ORNDORFF, M.D., Chicago; Clinical Assistant in Surgery, Northwestern University Medical School.
Education and Training of Interns and Residents.
FRODE JENSEN, M.D., Chicago; Council on Medical Education and Hospitals, American Medical Association.
Advancement of Medical Science.
BRIGADIER-GENERAL WALLACE H. GRAHAM, Washington; Physician to the President of the United States

Round Table Conference. The Problems Relating to the Obtaining of Complete and Scientific Medical Records.
Moderator: EVERETT W. JONES, Chicago.
Collaborators—(In addition to Panel participants)
FRANK C. SUTTON, M.D., Rochester; Assistant Medical Director, Rochester General Hospital
WILLIAM B. SELTZER, Cleveland; Superintendent, Mount Sinai Hospital.
L. J. CROZIER, M.D., London; Superintendent, Victoria Hospital.
GUY W. BRUGLER, M.D., Cleveland; Assistant Director, University Hospitals.
HELEN L. POTTS, R.N., Woodstock, Ontario; Administrator, Woodstock General Hospital.

Tuesday, 2:00 p.m.—Club Room B, Public Auditorium

Panel Discussion: Extending General Hospital Service to all Types of Patients.
HERMAN SMITH, M.D., Chicago; Hospital Consultant; Presiding.
Trends in the Care of Psychiatric Patients.
LEO M. LYONS, Chicago; Director, St. Luke's Hospital.

Trends in the Care of Tuberculous Patients.
HERMAN E. HILLEBOE, M.D., Washington; Medical Director, Tuberculosis Control Division, United States Public Health Service.
Trends in the Care of Chronically Ill Patients.
EDNA S. NICHOLSON, Chicago; Director, Central Service for the Chronically Ill.
Trends in the Care of Orthopedic Patients.
EDWARD L. COMPERE, Chicago; Associate Professor of Surgery, Rush Medical School.
Integration of Health Services in the Community.
GRAHAM L. DAVIS, Battle Creek; Hospital Director, W. K. Kellogg Foundation; President-Elect, American Hospital Association.
General Discussion—Question and Answer Period.
Led by HARVEY AGNEW, M.D., Toronto; Secretary, Canadian Hospital Council.

Tuesday, 7:30 p.m.—Little Theatre, Public Auditorium

Hospital Motion Picture
Joint Session for Hospital Trustees, Medical Staff Officers and Administrators.
FRED G. CARTER, M.D., Cleveland; Administrator, St. Luke's Hospital, Presiding.
The Governing Board of the Hospital.
RAYMOND W. SLOAN, New York; Editor, The Modern Hospital.
The Education of the Hospital Trustee.
ROBERT F. BINGHAM, Cleveland; President, Board of Trustees, St. Luke's Hospital; Chairman, Board of Trustees, Cleveland Hospital Council.
Minimum Qualifications to Practice Major Surgery.
FRANK S. GIBSON, M.D., Cleveland; Senior Clinical Instructor in Surgery, Western Reserve University School of Medicine.
Cooperation Between Blue Cross and Medical Service Plans.
ROLLO K. PACKARD, M.D., Chicago; Chairman, Board of Trustees, Woodlawn Hospital; Member, Board of Trustees, Blue Cross Plan for Hospital Care of Chicago.
Development of Training for Surgery.
CHARLES A. BOWERS, M.D., Cleveland; Head, Department of Urology, St. Luke's Hospital.

Wednesday, 7:45 a.m.—Lattice Room, Hotel Statler

Breakfast—Joint Conference on Hospital Public Relations.
Hospital personnel and press and radio representatives.
Conducted by GUY J. CLARK, Cleveland; Secretary, Cleveland Hospital Council.
Discussion of "The Hospital in the News"

Wednesday, 9:30 a.m.—Club Room B, Public Auditorium

Panel Discussion—The Responsibility of the Administrative Staff in Handling Emergencies Coming to the Hospital and Occurring Within.
Conducted by FRANK R. BRADLEY, M.D., St. Louis; Director, Barnes Hospital; President, American College of Hospital Administrators.
Transportation of the Injured and Other Types of Emergency Patients.
CHARLES W. MYERS, M.D., Indianapolis; Superintendent, Indianapolis City Hospital.
The Essentials of an Efficient Emergency Service in the Hospital.
FREDERICK A. RETTIG, M.D., Chicago; Chief of Staff, Alexian Brothers Hospital; Instructor, Loyola University School of Medicine.
Preparedness of the Hospital to Cope with Acute Emergencies:
Postoperative Hemorrhage in Tonsillectomy.
CARL H. MCCASKEY, M.D., Indianapolis; Professor of Otolaryngology and Chairman of Department, Indiana University School of Medicine.
Acute Respiratory Obstruction Requiring Emergency Intubation or Emergency Tracheotomy.
HORACE E. MITCHELL, M.D., Cleveland; Clinical Instructor of Otolaryngology, Western Reserve University School of Medicine; Chief of Department of Otolaryngology and Peroral Endoscopy, Lakewood City Hospital.
Sudden Collapse on Operating Table.
ROBERT L. SANDERS, M.D., Memphis; Associate Professor of Surgery, University of Tennessee College of Medicine; Head of the Surgical Section, Sanders Clinic.
Ante- and Post-partum Hemorrhage.
RALPH E. CAMPBELL, M.D., Madison; Associate Professor of Obstetrics and Gynecology, University of Wisconsin Medical School.
Emergencies Arising During the Administration of Anesthesia.
RALPH T. KNIGHT, M.D., Minneapolis; Associate Professor of Surgery, University of Minnesota Medical School; Director, Division of Anesthesiology, University of Minnesota Hospitals.

Wednesday, 2:00 p.m.—Club Room B, Public Auditorium

Panel Discussion on the Training of Hospital Personnel.
Conducted by CLAUDE W. MUNGER, M.D., New York; Director, St. Luke's Hospital; Director, Division of Hospital Administration, Columbia University.
University Training for Hospital Administration.
MALCOLM T. MACEACHERN, M.D., Chicago; Associate Director, American College of Surgeons; Director of Program in Hospital Administration, Northwestern University.
Establishing Administrative Internships or Residencies on a High Educational Level.
GERHARD HARTMAN, Ph.D., Iowa City; Superintendent, University of Iowa Hospitals.
Training Supervisory Personnel.
WARREN R. VON EHREN, Hines, Illinois; Chief, Utilization and Training Section, Veterans Administration Hospital.
Training Personnel Managers.
JANE F. CARLISLE, Cleveland; Personnel Director, St. Luke's Hospital.
Round Table Conference on Training Programs for Professional and Non-Professional Personnel.
Moderator: CHARLES E. PRALL, Ph.D., Chicago, Director, Joint Commission on Education.
Collaborators:
JOHN GORRELL, M.D., New York; Associate Director Hospital Administration, Columbia University School of Public Health.
JAMES W. STEPHAN, Canton; Associate Director, Division of Hospital Administration, University of Minnesota.
FRANK R. BRADLEY, M.D., St. Louis; Director, Barnes Hospital; President, American College of Hospital Administrators; Director, Division of Hospital Administration, Washington University.
LAURA G. JACKSON, Chicago; Director of Public Relations, American College of Surgeons; Associate Director, Program in Hospital Administration, Northwestern University.

MIRIAM CURTIS, R.N., Syracuse; Administrator, Syracuse Memorial Hospital.
LEO M. LYONS, Chicago; Director, St. Luke's Hospital.
NELLIE GORGAS, Minneapolis; Superintendent, St. Barnabas Hospital.

Wednesday, 7:30 p.m.—Little Theatre, Public Auditorium

Round Table Conference on Current Hospital Problems.
Moderator: EVERETT W. JONES, Chicago; Vice-President, The Modern Hospital Publishing Company, and MALCOLM T. MACEACHERN, M.D., Chicago; Associate Director, American College of Surgeons.
Collaborators:
O. K. FIKE, Dayton; Director, Miami Valley Hospital.
MERRILL F. STEELE, M.D., Cincinnati; Superintendent, Christ Hospital.
HENRY H. HOOPER, Cincinnati; Superintendent, Cincinnati General Hospital.
HELEN L. POTTS, R.N., Woodstock, Ontario; Superintendent, Woodstock General Hospital.
LEO M. LYONS, Chicago; Director, St. Luke's Hospital.
H. M. COON, M.D., Madison; Superintendent, State of Wisconsin General Hospital.
JOHN A. MCNAMARA, Cleveland; Director, Cleveland Hospital Service Association.
ROGER W. DEBUSK, M.D., Evanston; Executive Director, Evanston Hospital.

Thursday, 7:45 a.m.—Lattice Room, Hotel Statler

Breakfast Conference.
The Point Rating System as Applied to Hospitals.
MALCOLM T. MACEACHERN, M.D., Chicago; Associate Director, American College of Surgeons, Presiding.
Collaborators:
HARVEY AGNEW, M.D., Toronto; Secretary, Canadian Hospital Council.
HENRY G. FARISH, M.D., Chicago; American College of Surgeons.

Thursday, 9:30 a.m.—Club Room B, Public Auditorium

Panel Discussion on Management Techniques and Personnel Relations.
Conducted by JAMES A. HAMILTON, Minneapolis; Director, Program in Hospital Administration, University of Minnesota; Hospital Consultant.
Development of Management Skills as a Factor in Hospital Progress.
JAMES A. HAMILTON
Employment Policies; Incentives; Job Classification; Health Program.
Training Manual for Hospital Employees, Cleveland Hospital Council.
GUY J. CLARK, Cleveland; Executive Secretary, The Cleveland Hospital Council.
Round Table Conference—Questions and Answers.

Thursday, 2:00 p.m.—Club Room B, Public Auditorium

Small Hospital Session—Special Problems of the Small Hospital.
ELIZABETH JANE DAVIS, Niles, Michigan; Superintendent, Pawating Hospital, Presiding.
The Application of the Standard Nomenclature in the Small Hospital (Illustrated).
EDNA K. HUFFMAN, R.R.L., Chicago; Chief Medical Record Librarian, Wesley Memorial Hospital; Director, Program in Medical Record Library Science, Northwestern University.
Cooperative Relationships between the Small Hospital and the Metropolitan or Large Hospital.
ANDREW PATTULLO, Battle Creek; Associate Director, Hospital Division, Kellogg Foundation.
The Organization of the Medical Staff of the Small Hospital
R. R. CRAWFORD, M.D., Lakewood, Ohio; Superintendent, Lakewood Hospital.
Personnel Management in the Small Hospital.
MERTON E. KNISELY, Milwaukee; Superintendent, St. Luke's Hospital.

Thursday, 3:00 p.m.—Ballroom, Public Auditorium

Graduate Training in Surgery and the Surgical Specialties.
Moderator: ROBIN C. BUERKI, M.D., Philadelphia; Director, University Hospitals and Dean of the Graduate School of Medicine, University of Pennsylvania.
Panel Discussion from the standpoints of:
The American College of Surgeons.
MAJOR GENERAL CHARLES R. REYNOLDS (Ret.), Chicago Director, Department of Graduate Training in Surgery, American College of Surgeons.
The Basic Medical Sciences.
GEORGE H. MILLER, M.D., Chicago; Educational Director, American College of Surgeons.
The Veterans Administration.
PAUL B. MAGNUSON, M.D., Washington; Acting Assistant Medical Director for Research and Education, Veterans Administration.
The University-Connected Hospital.
JOHN R. PAINE, M.D., Minneapolis; Associate Professor of Surgery, University of Minnesota Medical School.
The Hospital not University-Connected.
GEORGE J. CURRY, M.D., Flint, Michigan; Director of Traumatic and Orthopedic Surgery, Hurley Hospital.

ASSEMBLY OF INITIATES

Friday, 1:00 p.m.—Ballroom, Public Auditorium

IRVIN ABELL, M.D., Louisville; President, Presiding.
Opening Remarks—General Organization of the College. IRVIN ABELL, M.D., Louisville.
The Program of the American College of Surgeons:
Hospital Standardization; Sectional Meetings; Medical Motion Pictures; Library and Literary Research.
MALCOLM T. MACEACHERN, M.D., Chicago; Associate Director and Chairman of the Administrative Board.
Graduate Training in Surgery.
MAJOR GENERAL CHARLES R. REYNOLDS (Ret.), Chicago; Director, Department of Graduate Training in Surgery.
Credentials Department; Clinical Research.
BOWMAN C. CROWELL, M.D., Chicago; Associate Director and Vice Chairman of the Administrative Board.
Fellowship in the American College of Surgeons.
ARTHUR W. ALLEN, M.D., Boston; Vice President, Board of Regents.
The Fellowship Pledge. Recital by Initiates.

ANNUAL MEETING, BOARD OF GOVERNORS OF THE AMERICAN COLLEGE OF SURGEONS

Wednesday, 12:00 Noon—Lattice Room, Hotel Statler

IRVIN ABELL, M.D., Louisville; President, Presiding.
Statement by the Chairman of the Board of Regents. IRVIN ABELL, M.D.
Brief Reports on the Activities, Problems and Progress of the American College of Surgeons.
BOWMAN C. CROWELL, M.D., Chicago; Associate Director and Vice Chairman of the Administrative Board.
MALCOLM T. MACEACHERN, M.D., Chicago; Associate Director and Chairman of the Administrative Board.
DALLAS B. PHEMISTER, M.D., Chicago; Treasurer.
FREDERICK A. COLLER, M.D., Ann Arbor; Regent.
PAUL B. MAGNUSON, M.D., Chicago; Secretary.
Discussion by Governors and Regents.

ADJOURNED MEETING, BOARD OF GOVERNORS

Thursday, 1:30 p.m.—Music Hall, Public Auditorium

IRVIN ABELL, M.D., Louisville; Chairman of the Board of Regents, Presiding.
Report of Committee on Nominations to the Board of Governors.

ANNUAL MEETING, FELLOWS OF THE AMERICAN COLLEGE OF SURGEONS

Thursday, 1:45 p.m.—Music Hall, Public Auditorium

IRVIN ABELL, M.D., Louisville; President, Presiding.
Report of Committee on Nominations to the Fellows.
Election of Officers.
Financial Report. DALLAS B. PHEMISTER, M.D., Chicago; Treasurer.
Report of Administrative Board. MALCOLM T. MACEACHERN, M.D., Chicago; Associate Director and Chairman of the Administrative Board.
Departmental Reports.
a. Hospital Standardization. b. Sectional Meetings. MALCOLM T. MACEACHERN, M.D., Chicago.
Graduate Training in Surgery. MAJOR GENERAL CHARLES R. REYNOLDS (Ret.), Chicago; Director, Department of Graduate Training in Surgery.

Credentials Department—Credentials Committees; Committees on Applicants; and Committee on History Reviews; Clinical Research. BOWMAN C. CROWELL, M.D., Chicago; Associate Director.
Medical Motion Pictures; Publications. ELEANOR K. GRIMM, Chicago; Administrative Executive.
Library and Literary Research. L. MARGUERIETE PRIME, Chicago; Director of Library and Literary Research.
Public Relations. LAURA G. JACKSON, Chicago; Director of Public Relations.
Committee on Cancer. FRANK E. ADAIR, M.D., New York; Chairman.
Committee on Fractures and Other Traumas. ROBERT H. KENNEDY, M.D., New York; Chairman.
Committee on Graduate Training in Surgery. DALLAS B. PHEMISTER, M.D., Chicago; Chairman.
Fellowship Obligations and Opportunities.
ARTHUR W. ALLEN, M.D., Boston; Regent and Vice Chairman, Board of Regents.
Closing Remarks. The American College of Surgeons and Postwar Progress.
IRVIN ABELL, M.D., Louisville; Chairman, Board of Regents.

COMMITTEE MEETINGS

IRVIN ABELL, M.D., Louisville; Chairman, Board of Regents, Presiding.

STATE AND PROVINCIAL EXECUTIVE COMMITTEES

Wednesday, 9:30 a.m.—Ballroom, Hotel Statler

Statement by the Chairman of the Board of Regents. IRVIN ABELL, M.D., Louisville.
Report on Sectional Meetings held in 1946 and Plans for Meetings in 1947.
MALCOLM T. MACEACHERN, M.D., Chicago.
Comments on Sectional Meetings, 1946–1947, in behalf of the Committees on Local Arrangements.
FRASER B. GURD, M.D., Montreal; CHARLES S. KENNEDY, M.D., Detroit; JAMES M. HAYES, M.D. Minneapolis; HUGH TOLAND JONES, M.D., Los Angeles.
Discussion by the Fellows and Regents.

STATE AND PROVINCIAL CREDENTIALS COMMITTEES AND COMMITTES ON APPLICANTS

Wednesday, 10:15 a.m.—Ballroom, Hotel Statler

Statement by the Chairman of the Board of Regents. IRVIN ABELL, M.D., Louisville.
Report of Work of Credentials Committees and Committees on Applicants, 1946.
BOWMAN C. CROWELL, M.D., Chicago; Associate Director.
Interesting Observations in Interviewing Prospective Candidates.
H. PRATHER SAUNDERS, M.D., Chicago; Assistant Director.
The Junior Candidate.
MAJOR GENERAL CHARLES R. REYNOLDS (Ret.) Chicago; Director, Department of Graduate Training in Surgery.
Discussion by the Fellows and Regents.

STATE AND PROVINCIAL JUDICIARY COMMITTEES

Wednesday, 11:00 a.m.—Ballroom, Hotel Statler

Statement by the Chairman of the Board of Regents. IRVIN ABELL, M.D., Louisville.
Selection and Appointment of Judiciary Committees and Procedure in Dealing with Judiciary Cases.
BOWMAN C. CROWELL, M.D., Chicago; Associate Director.
Types of Cases Referred to the Judiciary Committees.
MALCOLM T. MACEACHERN, M.D., Chicago; Associate Director.
Discussion by Regents and Fellows of the College.

PRELIMINARY CLINICAL PROGRAM

CLEVELAND CITY HOSPITAL

Tuesday

General Surgery

S. O. FREEDLANDER, D. M. GLOVER, W. C. MCCALLY, M. B. TALIAK, J. H. LAZZARI, C. A. HAMANN, R. J. MCNAMEE, M. H. LAMBRIGHT, J. S. GELLER, A. M. LEIGH.
9:00 a.m.—Operative clinic.

Tumor Surgery

L. A. POMEROY, S. O. FREEDLANDER, H. H. HAUSER, J. H. LAZZARI, A. E. BENNETT, and staff.
2:00 p.m.—Tumor clinic. Case presentations for diagnosis and treatment.

Pathology

H. T. KARSNER, H. G. SCHLUMBERGER, R. C. TAYLOR, and staff.
2:00 p.m.—Clinical pathological conference.

Fractures and other traumas

F. M. BARRY, D. DIAL, and staff.
2:00 p.m.—Fracture service; ward rounds; discussions of treatment and results.

Thoracic Surgery

S. O. FREEDLANDER, R. C. MCKAY, M. C. PERLICH, C. W. MUNZ, D. B. KAY, and staff.
2:00 p.m.—Group conference. Selection of cases for thoracoplasty, lobectomy, and pneumonectomy.

Wednesday

General Surgery

S. O. FREEDLANDER, D. M. GLOVER, W. C. MCCALLY, M. B. TALIAK, J. H. LAZZARI, C. A. HAMANN, R. J. MCNAMEE, M. H. LAMBRIGHT, J. S. GELLER, A. M. LEIGH.
9:00 a.m.—Operative clinic.
2:00 p.m.—Nonoperative clinic:
M. H. LAMBRIGHT. The acute abdomen in patients carrying artificial pneumoperitoneum.
J. S. GELLER. Acute obstructive cholecystitis.
A. M. LEIGH. Esophageal diverticula.
W. C. MCCALLY. Vagus nerve resection for peptic ulcer.
J. H. LAZZARI. Hemipelvectomy for sarcoma of femur.

Plastic Surgery

D. M. GLOVER and C. A. HAMANN.
9:00 a.m.—Operative clinic.
2:00 p.m.—Nonoperative clinic; case presentations—problems and management of skin flaps. Lantern slides.

Otolaryngology

C. W. ENGLER, W. F. HULSE, S. E. MISSAL, CRAMER and Associates.
9:00 a.m.—Operative clinic.
2:00 p.m.—Nonoperative clinic; demonstration of oral and laryngeal malignancies.

Thursday

Neurosurgery

C. S. BECK, C. W. ELKINS, and associates.
9:00 a.m.—Operative clinic.
2:00 p.m.—Nonoperative clinic.
2:00 p.m.—C. W. ELKINS—Acrylic plastics in skull defects.

Vascular Surgery

L. A. ATLAS and associates.
9:00 a.m.—Operative clinic; lumbar sympathectomy; saphenous vein ligations.
2:00 p.m.—Nonoperative clinic; demonstration of venograms; indications for femoral vein ligations.

Genitourinary Surgery

H. R. TRATTNER, A. ROTH, and associates.
9:00 a.m.—Operative clinic.

General Surgery

R. W. SCOTT, S. O. FREEDLANDER, M. H. LAMBRIGHT, E. CHESTER, D. M. GLOVER, M. B. TALIAK, A. M. MARSHALL, J. H. LAZZARI, H. HOELSCHER, A. S. BROGLIO.
2:00 p.m.—Nonoperative clinic: lesions of stomach and intestine; pancreatic lithiasis with steatorrhea.

Friday

Thoracic Surgery

S. O. FREEDLANDER, D. B. KAY, C. W. MUNZ, and associates.
9:00 a.m.—Operative clinic: pneumonectomy, lobectomy, thoracoplasty.
2:00 p.m.—Nonoperative clinic.
2:00 p.m.—Motion pictures: esophagectomy, pneumonectomy, lobectomy.

Orthopedic Surgery

L. M. STARIN, A. TRAMER, P. H. DUBAY, and associates.
9:00 a.m.—Operative clinic: Spinal fusion.
9:00 a.m.—Nonoperative clinic.

Gynecology

J. L. REYCRAFT, A. E. BENNETT, E. RICHARDS, and associates.
9:00 a.m.—Operative clinic: Plastics; vaginal hysterectomy; Watkin's interposition.

Radiology

HARRY HAUSER and associates.
9:00 a.m.—A. R. COHEN—Roentgen diagnosis of lesions of small intestine.
10:00 a.m.—H. HAUSER—Roentgen diagnosis of thoracic tumors.
11:00 a.m.—B. BROWN—Differential roentgen diagnosis of mechanical and adynamic ileus.

CLEVELAND CLINIC

Tuesday

General Surgery

T. E. JONES and GEORGE CRILE, JR.
8:00 a.m.—Operative surgery and demonstration of cases.

R. L. HADEN, L. W. DIGGS, D. W. BORTZ and R. S. DINSMORE.
9:00 a.m.—Symposium—spleen: General considerations; platelets in hemorrhagic disease; presentation of cases; surgical aspects.

IRVINE H. PAGE, Leader; A. C. CORCORAN, ROBERT D. TAYLOR and W. JAMES GARDNER.
11:00 a.m.—Symposium—hypertension: General considerations; selection of cases for surgery; surgical aspects.

Genitourinary Surgery

CHARLES C. HIGGINS.
8:00 a.m.—Operative clinic.

Ophthalmology

A. D. RUEDEMANN.
8:00 a.m.—Operative clinic.

Orthopedic Surgery

JAMES A. DICKSON and J. I. KINDRICK.
8:30 a.m.—Operative clinic.

Otolaryngology

PAUL M. MOORE, JR.
10:00 a.m.—Operative clinic.

H. E. HARRIS.
1:00 p.m.—Operative clinic.

Pathology

JOHN B. HAZARD.
10:00 a.m.—Surgical pathological conference.

JOHN B. HAZARD.
11:45 a.m.—Demonstration of surgical pathological specimens.

Neurosurgery

W. JAMES GARDNER, A. T. BUNTS, and W. A. NOSIK.
1:00 p.m.—Operative clinic.

Wednesday

General Surgery

T. E. JONES.
8:00 a.m.—Operative clinic.

GEORGE CRILE, JR., Leader; E. N. COLLINS, JOHN F. RENSHAW, J. C. ROOT, and HAROLD R. ROSSMILLER.
9:00 a.m.—Symposium: Upper stomach and pancreas.

R. S. DINSMORE.
1:30 p.m.—Operative clinic.

Genitourinary Surgery

CHARLES C. HIGGINS.
8:00 a.m.—Operative clinic.

W. E. LOWER, CHARLES C. HIGGINS, W. J. ENGEL.
10:00 a.m.—Genitourinary clinic: Presentation of cases and discussion.

T. E. JONES and associates.
11:00 a.m.—Clinic: Diseases of colon.

Ophthalmology

A. D. RUEDEMANN and R. J. KENNEDY.
8:00 a.m.—Demonstration of cases.

Otolaryngology

PAUL M. MOORE, JR.
10:00 a.m.—Operative clinic and demonstration of cases.

Pathology

JOHN B. HAZARD.
11:45 a.m.—Demonstration of surgical pathological specimens.

Neurosurgery

W. JAMES GARDNER, A. T. BUNTS and W. A. NOSIK.
1:00 p.m.—Operative clinics.

Thursday

General Surgery

T. E. JONES and GEORGE CRILE, JR.
8:00 a.m.—Operative clinics.

IRVINE H. PAGE, Leader; A. C. CORCORAN, ROBERT D. TAYLOR, and W. JAMES GARDNER.
11:00 a.m.—Symposium—Hypertension: General considerations; selection of cases for surgery; surgical aspects.

Genitourinary Surgery

CHARLES C. HIGGINS.
8:00 a.m.—Operative clinic.

WILLIAM J. ENGEL.
1:00 p.m.—Operative clinic and demonstration of cases.

Ophthalmology

A. D. RUEDEMANN and R. J. KENNEDY.
8:00 a.m.—Operative clinic.

Orthopedic Surgery

JAMES A. DICKSON and J. I. KENDRICK.
8:30 a.m.—Operative clinic.

JAMES A. DICKSON, Leader; J. I. KENDRICK, and DR. PHALEN.
10:00 a.m.—Clinic—Hip Joint.

Otolaryngology

PAUL M. MOORE, JR.
10:00 a.m.—Operative clinic.

H. E. HARRIS.
1:00 p.m.—Operative clinic.

Pathology

JOHN B. HAZARD.
11:45 a.m.—Demonstration of surgical pathological specimens.

Neurosurgery

W. JAMES GARDNER, Leader; A. T. BUNTS, W. A. NOSIK, and A. STOWELL.
9:00 a.m.—Clinic: Presentation of cases and discussion.

W. JAMES GARDNER, A. T. BUNTS, and W. A. NOSIK.
1:00 p.m.—Operative clinic.

Weekly Surgical Staff Conference

1:30 p.m.—Staff.

Friday

General Surgery

T. E. JONES.
8:00 a.m.—Operative clinics.
R. S. DINSMORE, E. PERRY MCCULLAGH, GEORGE CRILE, JR., and A. C. ERNSTENE.
9:00 a.m.—Thyroid clinic: Presentation of cases and discussion.
DONALD B. HALE, U. V. PORTMANN, and HAROLD E. HARRIS.
10:00 a.m.—Discussion of special problems: Safeguards in spinal anesthesia; radiation therapy in carcinoma of breast; treatment of esophageal varices.
IRVINE H. PAGE, Leader; A. C. CORCORAN, OTTO GLASSER, and W. JAMES GARDNER.
11:00 a.m.—Symposium—Shock: Crush syndrome; intra-arterial transfusions; induced hypotension.
R. S. DINSMORE.
1:30 p.m.—Operative clinic.

Genitourinary Surgery

CHARLES C. HIGGINS.
8:00 a.m.—Operative clinic.

Ophthalmology

A. D. RUEDEMANN, and R. J. KENNEDY.
8:00 a.m.—Operative clinic.

Orthopedic Surgery

JAMES A. DICKSON, and J. I. KENDRICK.
8:30 a.m.—Operative clinic.

Otolaryngology

PAUL M. MOORE, JR.
10:00 a.m.—Operative clinic.

Pathology

JOHN B. HAZARD.
11:45 a.m.—Demonstration of surgical pathological specimens.

Neurosurgery

W. JAMES GARDNER, A. T. BUNTS, and W. A. NOSIK.
1:00 p.m.—Operative clinic.

EVANGELICAL DEACONESS HOSPITAL

Wednesday

General Surgery

J. R. JOHNSON and associates.
9:00 a.m.—Operative and nonoperative clinic.

Thursday

General Surgery

O. A. WEBER and associates.
9:00 a.m.—Operative and nonoperative clinic.

Friday

General Surgery

S. C. LIND and associates.
9:00 a.m.—Operative and nonoperative clinic.

FAIRVIEW PARK HOSPITAL

Tuesday

General Surgery

W. E. SMITH and F. H. HEYSE.
9:00 a.m.—Operative clinic.

Obstetrics and Gynecology

E. D. SAUNDERS.
9:00 a.m.—Operative clinic.

Wednesday

General Surgery

H. W. MASENHIMER and J. R. KELKER.
9:00 a.m.—Operative clinic.

Genitourinary Surgery

L. F. HUFFMAN.
9:00 a.m.—Operative clinic.

Thursday

Orthopedic Surgery

G. I. BAUMAN.
9:00 a.m.—Operative clinic.

Roentgenology

E. V. BAEYER.
9:00 a.m.—Demonstration of films.

Obstetrics and Gynecology

E. D. SAUNDERS.
2:00 p.m.—Nonoperative clinic.

Friday

General Surgery

H. W. MASENHIMER, W. E. SMITH, J. R. KELKER, and F. H. J. HEYSE.
9:00 a.m.—Operative clinic.

Otolaryngology

W. H. RIEGER.
2:00 p.m.—Operative clinic.

GRACE HOSPITAL

Tuesday

Obstetrics and Gynecology

PAUL F. HASSE.
2:00 p.m.—Operative clinic.

Ophthalmology and Otolaryngology

H. W. COOPER.
2:00 p.m.—Operative clinic.

Wednesday

General Surgery

HARRY C. BARR.
9:00 a.m.—Operative and nonoperative clinic, rectal.
A. E. BIDDINGER.
2:00 p.m.—Operative clinic.

Thursday

General Surgery

F. P. GERACI.
9:00 a.m.—Operative clinic.
L. J. STERNICKI.
9:00 a.m.—Operative clinic.

Roentgenology

H. H. HAUSER.
2:00 p.m.—X-ray demonstration.

Friday

General Surgery

S. M. ADAMS.
9:00 a.m.—Operative clinic.

Genitourinary Surgery

C. B. MILLER.
9:00 a.m.—Operative genitourinary clinic.

Pathology

D. K. REHBOCK.
2:00 p.m.—Pathological demonstration.

HURON ROAD HOSPITAL

Tuesday

General Surgery

H. W. BROWN, J. L. BILTON and W. J. RENNER.
8:00 a.m.—Gastric resections; intestinal resections.
R. J. WHITACRE and staff.
Anesthesia clinic.
E. A. MARSHALL.
2:00 p.m.—Nonoperative clinic—gastroenterology.

Obstetrics and Gynecology

A. G. CUMMINGS and G. H. IRVIN, JR.
8:00 a.m.—Operative clinic.

Wednesday

General Surgery

H. W. BROWN, J. L. BILTON, and W. J. RENNER.
8:00 a.m.—Thyroidectomies and mastectomies.
A. E. BIDDINGER.
2:00 p.m.—Surgical nonoperative clinic.
R. J. WHITACRE.
2:00 p.m.—Anesthesia clinic.
EDWARD GOODSITT.
2:00 p.m.—Operation of a blood bank in a general hospital.

Genitourinary Surgery

C. C. PERRY and L. K. BROOKS.
8:00 a.m.—Rectal surgery.
V. C. LAUGHLIN and departmental personnel.
2:00 p.m.—Nonoperative clinic: Urography and interpretation of pyelograms.

Obstetrics and Gynecology

G. H. IRVIN, JR., and G. J. SALISBURY.
8:00 a.m.—Vaginal hysterectomies and vaginal repairs.

Otolaryngology

G. H. QUAY.
9:00 a.m.—Operations: Harelip and mastoid.

Pathology

EDWARD GOODSITT.
2:00 p.m.—Clinicopathological conference.

Thursday

General Surgery

A. E. BIDDINGER, B. B. KIMMEL, T. L. LAUGHLIN, and L. L. CHANDLER.
8:00 a.m.—Operative clinic.
R. J. WHITACRE and staff.
2:00 p.m.—Anesthesia clinic.

Obstetrics and Gynecology

G. M. HAWK and S. E. BURKHART.
8:00 a.m.—Gynecological operations.

Genitourinary Surgery

V. C. LAUGHLIN and departmental personnel.
8:00 a.m.—Renal and prostatic surgery.

Orthopedic Surgery

A. H. REED and staff.
8:00 a.m.—Operative clinic: Fractured hips, open reductions, and tendon transplants.

Pathology

EDWARD GOODSITT.
2:00 p.m.—Clinicopathological conference.

Friday

General Surgery

H. W. BROWN, J. L. BILTON, and W. J. RENNER.
8:00 a.m.—Cholecystectomies and gastric resections.
R. J. WHITACRE and staff.
2:00 p.m.—Anesthesia clinic.

Obstetrics and Gynecology

S. E. BURKHART, G. H. IRVIN, JR., and A. G. CUMMINGS.
8:00 a.m.—Operative clinic.
A. G. CUMMINGS and G. H. IRVIN, JR.
2:00 p.m.—Nonoperative clinic.

Ophthalmology

JOSEPHINE DIRION PHILLIPS and C. I. THOMAS.
9:00 a.m.—Operations.

LAKESIDE HOSPITAL—UNIVERSITY HOSPITALS

Tuesday

General Surgery

DARRELL T. SHAW.
8:00 a.m.—Operative clinic: Plastic surgery.
CLAUDE S. BECK.
8:00 a.m.—Operative clinic: Neurosurgery and cardiac surgery.
CLAUDE S. BECK.
10:30 a.m.—Nonoperative clinic: Demonstration cardiac surgical cases.

Orthopedic Surgery

MAXWELL HARBIN, J. A. MURPHY, and W. J. MASSEY.
8:00 a.m.—Operative clinic.
10:30 a.m.—Demonstration of orthopedic cases.

Fractures and Other Traumas

DARRELL T. SHAW.
10:30 a.m.—Nonoperative clinic: Scar and wound excision.

Ophthalmology

A. B. BRUNER and LORAND JOHNSON.
8:30 a.m.—Operative clinic.

Pathology

HOWARD T. KARSNER.
12:30 p.m.—Pathological conference.

Wednesday

General Surgery

CARL H. LENHART, J. W. HOLLOWAY, FREDERICK R. MAUTZ, F. S. GIBSON, H. G. SLOAN, JOHN J. THORNTON, WILLIAM D. HOLDEN, FRANK M. BARRY, ELDEN C. WECKESSER.
8:00 a.m.—Operative clinics.
10:30 a.m.—Nonoperative clinics.
CARL H. LENHART. Introductory remarks.
FREDERICK R. MAUTZ. Surgical aspects of bleeding peptic ulcer.
JOHN W. HOLLOWAY. Ulcers of lesser curvature associated with hypoacidity.
FRANK M. BARRY. Summary of results obtained by Lakeside House officers in resection of the stomach.
WILLIAM D. HOLDEN. Treatment of venous thrombosis.
HIRAM O. STUDLEY. Percentage weight loss as a basic indicator of surgical risk in patients with chronic peptic ulcer.
JAMES J. JOELSON. Urinary calculi in recumbent patients.
FREDERICK R. MAUTZ. Esophagectomy for obstructive lesions of the esophagus.

Genitourinary Surgery

JAMES J. JOELSON and JOHN E. WILLIAMS.
8:00 a.m.—Operative clinics.

Thoracic Surgery

FREDERICK R. MAUTZ.
8:00 a.m.—Operative clinic.

Ophthalmology

A. B. BRUNER and M. P. MOTTO.
8:30 a.m.—Operative clinic.
C. I. THOMAS.
1:30 p.m.—Nonoperative clinic: Ophthalmological dispensary clinic.

Thursday

General Surgery

DARRELL T. SHAW.
8:00 a.m.—Operative clinic: Plastic surgery.
CLAUDE S. BECK.
8:00 a.m.—Operative clinic: Neurosurgery and cardiac surgery.
DARRELL T. SHAW.
10:30 a.m.—Nonoperative clinic: Application of tubes and flaps to surface defects of the extremities.
4:30 p.m.—Surgical conference.

Orthopedic Surgery

C. H. HEYMAN, W. G. MCGAW, and C. G. BARBER.
8:00–10:30 a.m.—Operative clinic.
10:30 a.m.–12:30 p.m.—Nonoperative clinic: Demonstration of orthopedic cases.

Ophthalmology

A. B. BRUNER and LORAND JOHNSON.
8:30 a.m.—Operative clinic.

Neurosurgery

CLAUDE S. BECK.
10:30 a.m.–12:30 p.m.—Demonstration of neurosurgical cases.

Friday

General Surgery

CARL H. LENHART, J. W. HOLLOWAY, FREDERICK R. MAUTZ, F. S. GIBSON, H. G. SLOAN, JOHN J. THORNTON, WILLIAM D. HOLDEN, FRANK M. BARRY, ELDEN C. WECKESSER.
8:00–10:30 a.m.—Operative clinics.
10:30 a.m.–12:30 p.m.—Nonoperative clinics:
WILLIAM D. HOLDEN. Surgical treatment of arteriosclerotic and diabetic gangrene.
FRANK M. BARRY. Presentation of two cases of adenoma of the pancreas.
JOHN W. HOLLOWAY. Adenoma of parathyroid with hyperparathyroidism (7 cases).
JOHN J. THORNTON. An unusual case of esophageal diverticulum.
ELDEN C. WECKESSER. Surgery of the hand.
JOHN E. WILLIAMS. Treatment of perirenal and renal abscesses.

Genitourinary Surgery

JAMES J. JOELSON and JOHN E. WILLIAMS.
8:00 a.m.—Operative clinic.

Ophthalmology

A. B. BRUNER and C. I. THOMAS.
8:30 a.m.—Operative clinic.
W. B. CHAMBERLIN, JR.
1:30 p.m.—Nonoperative clinic: Ophthalmological dispensary clinic.

LAKEWOOD HOSPITAL

Tuesday

Obstetrics and Gynecology

BURDETT WYLIE.
2:00 p.m.—Nonoperative clinic: Discussion of obstetrica problems in a small general hospital.

Otolaryngology

Staff.
2:00 p.m.—Nonoperative clinic: Peroral endoscopy; vertigo due to eustachian tube obstruction and its treatment.

Genitourinary Surgery

L. F. HUFFMAN.
2:00 p.m.—Nonoperative clinic: Urological demonstrations.

Wednesday

General Surgery

C. LEE GRABER and associate members of visiting surgical staff.
9:00 a.m.—Operative clinics.
C. LEE GRABER.
2:00 p.m.—Nonoperative clinic: Improved and simplified technique for intravenous medication.

Orthopedic Surgery

LOUIS M. STARIN and PAUL H. DUBE.
9:00 a.m.—Operative and nonoperative clinic.

Otolaryngology

FORREST W. MERICA.
2:00 p.m.—Nonoperative clinic: Vertigo due to eustachian tube obstruction and its treatment.

Thursday

General Surgery

NORTH W. SHETTER.
9:00 a.m.—Exhibit of interesting x-ray cases; discussion of radiological problems.
STANLEY N. P. DEVILLE and G. C. RANKIN.
9:00 a.m.—Demonstration of technique of spinal anesthesia.

Otolaryngology

RALPH W. FRACKELTON.
9:00 a.m.—Operations: Nasal plastic.
Staff.
2:00 p.m.—Nonoperative clinic: Peroral endoscopy.

LUTHERAN HOSPITAL

Tuesday

General Surgery

D. S. SPRENG, J. H. LAZZARI, F. A. CATALANO, W. R. HODGES, H. H. ROENICK, E. R. HEXTER.
9:00 a.m.—Operative clinic.
J. P. EICHHORN, J. A. GROH, and H. G. SLOAN.
10:00 a.m.—Nonoperative clinic—Symposium on peptic ulcer: Medical aspects; radiological aspects; surgical aspects.

Wednesday

General Surgery

H. G. SLOAN, B. B. LARSEN, V. L. TICHY, J. H. TILDES, E. C. ROY, J. F. HATTENBACH.
9:00 a.m.—Operative clinic.
Staff—J. H. LAZZARI, Chairman.
10:30 a.m.—Tumor clinic—Presentation of current cases.

Thursday

General Surgery

F. S. GIBSON, J. T. BOHM, G. A. TISCHLER, C. E. WARD, C. F. WARD, CONRAD OTTELIN, C. W. HAHN.
9:00 a.m.—Operative clinic.
F. S. GIBSON, FRANCIS BAYLESS, and J. A. GROH.
10:30 a.m.—Nonoperative clinic: Symposium on diseases of the breast: The clinical diagnosis; pathology of breast tumors; the value of x-ray as a postoperative agent.

Friday

General Surgery

S. C. LIND, J. H. LAZZARI, I. J. GOODMAN, B. B. LARSEN, D. S. SPRENG.
9:00 a.m.—Operative clinic.

Ophthalmology

W. P. CHAMBERLAIN, JR.
9:00 a.m.—Operative clinic.

Genitourinary Surgery

D. A. CHAMBERS and W. E. FORSYTHE.
9:00 a.m.—Operative clinic.

THE POLYCLINIC HOSPITAL

Tuesday

General Surgery

HENRY A. SCHLINK.
8:00 a.m.—Operative clinic.
JOHN R. PLENT.
10:00 a.m.—Operative clinic.

Obstetrics and Gynecology

WILLIAM N. MACEY.
11:00 a.m.—Operative clinic.

Wednesday

General Surgery

PAUL M. SPURNEY.
9:00 a.m.—Operative clinic.
WILLIAM KUTLER.
10:00 a.m.—Operative clinic.
CHARLES J. PROCHASKA.
11:00 a.m.—Operative clinic.

Fractures and Other Traumas

S. L. ROBBINS.
9:00 a.m.—Fracture clinic.

Genitourinary Surgery

HARRY R. TRATTNER.
9:00 a.m.—Nonoperative clinic: Prostatectomy.

Thursday

General Surgery

JOHN T. VITKUS.
9:00 a.m.—Operative clinic.
A. J. KAZLAUCKAS.
10:00 a.m.—Operative clinic.

Otolaryngology

A. L. STOTTER.
9:00 a.m.—Nasal reconstruction.

Pathology

Nonoperative clinic.
11:00 a.m.—Clinical pathological conference.

Friday

Nonoperative clinic.
9:00 a.m.—Carcinoma, corpus uteri; spontaneous rupture of uterus; intestinal obstruction; ectopic gestation.

MACDONALD HOUSE—UNIVERSITY HOSPITALS

Tuesday

Gynecology and Obstetrics

J. L. REYCRAFT,
9:30 a.m.—Gynecology operative clinic.
W. R. BARNEY.
11:00 a.m.—Ward rounds.

Wednesday

Gynecology and Obstetrics

R. L. FAULKNER.
9:30 a.m.—Symposium: Uterine bleeding.
L. A. POMEROY.
11:00 a.m.—Carcinoma cervix.

Thursday

Gynecology and Obstetrics

R. L. FAULKNER.
9:30 a.m.—Obstetrics and gynecology pathological conference.
R. A. SHIPLEY.
11:00 a.m.—Presentation of gynecological endocrine problems.

MOUNT SINAI HOSPITAL

Tuesday

Orthopedic Surgery

RUDOLPH S. REICH, A. MILLER, A. W. TRAMER, S. KLEIN, A. H. DRIELS.
8:00 a.m.—Operative clinic.

Obstetrics and Gynecology

JACOB L. BUBIS and staff.
9:00 a.m.—Nonoperative clinic.

Oral Surgery

EDWARD REITER.
2:00 p.m.—Nonoperative clinic.

Genitourinary Surgery

D. SCHNEIDER.
9:00 a.m.—Nonoperative clinic: Traumatic-urological complications of abdominal surgery.
J. GALVIN.
9:00 a.m.—Nonoperative clinic: Carcinoma of the ureter.
A. ROTH.
9:00 a.m.—Nonoperative clinic: Carcinoma of the kidney.

Wednesday

General Surgery

S. O. FREEDLANDER, H. M. GANS, H. H. PEVAROFF, DR. HOFFMAN, DR. GELLER, DR. BOOKATZ.
8:00 a.m.—Operative clinic.

Pathology

B. J. KLINE and DR. YOUNG.
2:00 p.m.—Clinical pathology.

Ophthalmology

H. M. GANS and staff.
2:00 p.m.—Nonoperative clinic: Ophthalmological problems illustrated with kodachrome slides.

Otorhinolaryngology

S. S. QUITTNER and S. BAUMOEL.
9:00 a.m.—Nonoperative clinic: Vertigo.

Thursday

Obstetrics and Gynecology

JACOB L. BUBIS and staff.
8:00 a.m.—Operative clinic.

General Surgery

S. O. FREEDLANDER and staff.
9:00 a.m.—Nonoperative clinic.

Pathology

B. J. KLINE and DR. YOUNG.
2:00 p.m.—Pathological conference.

Friday

General Surgery

S. O. FREEDLANDER and staff.
8:00 a.m.—Operative clinic.

Orthopedic Surgery

RUDOLPH S. REICH and staff.
9:00 a.m.—Nonoperative clinic: End results of ununited fractures of the femoral neck; fractures of the elbow; fractures of the calcaneous; unreduced Pott's fractures.

ST. ALEXIS HOSPITAL

Tuesday

General Surgery

J. F. CORRIGAN, W. F. BOUKALIK, E. F. KIEGER, E. A. MASTICS, F. A. SPITTLER, J. N. WYCHGEL.
9:00 a.m.—Operative clinic.

Genitourinary Surgery

J. A. SOMMER and C. R. NUCKOLLS.
9:00 a.m.—Operative clinic.

Neurosurgery

E. W. SHANNON.
9:00 a.m.—Operative clinic.

Ophthalmology

H. V. PHELAN.
9:00 a.m.—Operative clinic.
10:00 a.m.—Demonstration of cases.

Otolaryngology

F. W. DIXON and FRED ADELSTEIN.
9:00 a.m.—Operative clinic.

Wednesday

General Surgery

J. F. CORRIGAN, W. F. BOUKALIK, E. F. KIEGER, E. A. MASTICS, F. A. SPITTLER, J. N. WYCHGEL.
9:00 a.m.—Operative clinic.

Genitourinary Surgery

J. A. SOMMER and C. R. NUCKOLLS.
9:00 a.m.—Operative clinic.

Ophthalmology

H. V. PHELAN.
9:00 a.m.—Operative clinic.

Thursday

General Surgery

J. F. CORRIGAN, W. F. BOUKALIK, E. F. KIEGER, E. A. MASTICS, F. A. SPITTLER, J. N. WYCHGEL.
9:00 a.m.—Operative clinic.

Genitourinary Surgery

J. A. SOMMER and C. R. NUCKOLLS.
9:00 a.m.—Operative clinic.

Neurosurgery

E. W. SHANNON.
9:00 a.m.—Operative clinic.

Ophthalmology

H. V. PHELAN.
9:00 a.m.—Operative clinic.

Otolaryngology

F. W. DIXON and FRED ADELSTEIN.
9:00 a.m.—Operative clinic.

ST. JOHN'S HOSPITAL

Tuesday

General Surgery

J. R. RIPTON.
9:00 a.m.—Operative clinic: Thyroid surgery.
J. W. HANNIBAL.
9:00 a.m.—Operative clinic: Gall-bladder and common duct surgery.
WILLIAM NOVINCE.
9:00 a.m.—Nonoperative clinic: Discussion of liver function tests.

Otolaryngology

J. T. COLLINS.
10:00 a.m.—Operative clinic: Radical antrum.

Neurosurgery

E. W. SHANNON.
10:00 a.m.—Operative clinic: Intervertebral disc.

Wednesday

General Surgery

J. R. RIPTON.
9:00 a.m.—Operative clinic: Gall bladder.
C. E. STEYER.
11:00 a.m.—Nonoperative clinic: liver and gall bladder.
WILLIAM E. MISHLER.
10:00 a.m.—Operative clinic: Hernia.

Genitourinary Surgery

J. A. SOMMER.
9:00 a.m.—Operative clinic: Nephrectomy.
WILLIAM J. MANNING.
10:00 a.m.—Nonoperative clinic: Indications for suprapubic prostatectomy.

Roentgenology

DAVID STEEL.
2:00 p.m.—Tumor clinic.
H. C. HARTZELL.
2:00 p.m.—Tumor clinic.

Thursday

General Surgery

F. T. GALLAGHER.
9:00 a.m.—Gastric resection (indications for Billroth No. 1 and Hoffmeister-Balfour resections).
J. E. HANNIBAL.
9:00 a.m.—Thyroid surgery.

Fractures and Other Traumas

R. J. SCHRAFF.
10:00 a.m.—Intracapsular fracture of neck of femur, Smith-Petersen nail.

Otolaryngology

F. L. MCGANNON.
10:00 a.m.—Nonoperative clinic: Hemangioma of uvula

Thoracic Surgery

C. W. MUNZ.
11:00 a.m.—Operative clinic.

Friday

General Surgery

J E. HANNIBAL.
9:00 a.m.—Carcinoma of the recto-sigmoid, anterior resection.
F. T. GALLAGHER.
9:00 a.m.—Combined abdomino-perineal resection.
R. J. SCHRAFF.
9:00 a.m.—Nonoperative clinic: Skin graft.
WILLIAM E. MISHLER.
11:00 a.m.—Nonoperative clinic: Injury to knee.

Otolaryngology

DAVID STEEL.
10:00 a.m.—Radiation in otolaryngology.

ST. LUKE'S HOSPITAL

Tuesday

General Surgery

D. M. GLOVER, R. S. MCGINNIS, and staff.
9:00 a.m.—Operative clinic.
B. B. SANKEY and staff.
9:00 a.m.—Demonstration in anesthesia.

Thoracic Surgery

EARLE B. KAY.
9:00 a.m.—Operative clinic.

Pathology

RAFAEL DOMINGUEZ and staff.
1:30 p.m.—Surgical pathological conference.

General Surgical Clinic

ERNEST F. BRIGHT.
2:30 p.m.—Peripheral vascular clinic.
R. S. MCGINNIS.
2:50 p.m.—Early ambulation in relation to postoperative complications.
HAROLD J. THEISEN.
3:10 p.m.—Amino acid therapy.
EDMUND E. BEARD.
3:20 p.m.—Thiouracil in thyrotoxicosis.
JOHN A. TOPINKA.
3:50 p.m.—Work of the tissue committee.
JOHN H. NICHOLS.
4:00 p.m.—Psychic disorders simulating surgical conditions.
D. M. GLOVER.
4:20 p.m.—Wound management.
Discussion.
4:35 p.m.

Thoracic Surgical Clinic

EARLE B. KAY.
2:30 p.m.—Pneumonectomies (motion pictures).
EARLE B. KAY.
2:50 p.m.—Esophageal resections for stricture.
A. D. NICHOL.
3:10 p.m.—Follow-up on patent ductus cases from the cardiac clinic.
Discussion.
3:40 p.m.

Wednesday

General Surgery

B. B. SANKEY and staff.
9:00 a.m.—Demonstrations in anesthesia.

Neurosurgery

SPENCER BRADEN.
9:00 a.m.—Operative clinic.
2:00 p.m.—Neurosurgical clinic:
SPENCER BRADEN.
2:00 p.m.—The herniated disc.
DON D. BRANNAN.
2:30 p.m.—Myelography.
F. R. HILL and SPENCER BRADEN.
2:50 p.m.—Management of head injuries.
JOHN H. NICHOLS.
3:00 p.m.—The traumatic neurosis.

Orthopedic and Traumatic Surgery

T. A. WILLIS and staff.
9:00 a.m.—Operative clinic.
3:30 p.m.—Orthopedic and traumatic surgery clinic:
T. A. WILLIS.
3:30 p.m.—Management of the fractured hip.
B. B. LARSEN.
3:50 p.m.—Fixation of the hip (motion pictures).
W. H. MCGAW.
4:10 p.m.—Internal derangements of the knee; peumograms.
Discussion.
4:40 p.m.

Obstetrics and Gynecology

C. T. HEMMINGS, G. B. HURD, and staff.
9:00 a.m.—Operative clinic.
2:00 p.m.—Obstetrical and gynecological clinic:
C. T. HEMMINGS.
2:00 p.m.—Conduct of normal delivery (motion pictures).
C. T. HEMMINGS.
2:30 p.m.—Operative obstetrics (motion pictures).
GERALD B. HURD.
3:00 p.m.—Management of uterine displacements.

Tumor Conference

D. D. BRANNAN and R. DOMINGUEZ.
3:30 p.m.—Lymphoma.
L. A. POMEROY.
3:45 p.m.—Carcinoma of the cervix.
GERALD B. HURD.
4:00 p.m.—Carcinoma of the uterine body.
R. B. HERRICK.
4:15 p.m.—Bone tumors.
R. S. MCGINNIS.
4:30 p.m.—Carcinoma of stomach; carcinoma of colon.
P. J. ROBECHEK.
4:45 p.m.—Carcinoma of the breast.

Thursday

General Surgery

B. B. SANKEY and staff.
9:00 a.m.—Demonstrations in anesthesia.
2:00 p.m.—Clinic on anæsthesiology.
G. R. HAMILTON.
2:00 p.m.—Supportive therapy in the operating room.
R. M. CRANE.
2:20 p.m.—Anesthesia in thyroid surgery.
L. E. CAMPBELL.
2:40 p.m.—Clinical aspects of curare.
B. B. SANKEY.
3:00 p.m.—Some aspects of spinal anesthesia.

Plastic and Maxillofacial Surgery

D. M. GLOVER and D. T. SHAW.
9:00 a.m.—Operative clinic.
D. M. GLOVER, D. T. SHAW, C. A. HAMANN, and GAYLORD JAMES, D.D.S.
3:15 p.m.—Plastic and maxillofacial surgery clinic: operative management of the harelip (motion pictures); Cleft Palate Problems: surgery, speech training, prosthesis; various applications of split thickness grafts; pedicle grafts; hand problems; reconstruction of external ear; temporomandibular ankylosis.

Orthopedic and Traumatic Surgery

T. A. WILLIS.
9:00 a.m.—Orthopedic and traumatic surgical operations.
WALLACE S. DUNCAN, T. A. WILLIS, W. A. ENGEL, D. M. GLOVER.
2:00 p.m.—Orthopedic and traumatic surgery clinic: Disabilities of the ankle joint; low back pain; 20 year review of burns.

Friday

General Surgery

B. B. SANKEY and staff.
9:00 a.m.—Anesthesia demonstrations.
9:00 a.m.—General surgical clinic.
P. J. ROBECHEK.
9:00 a.m.—Postoperative complications and deaths.
R. S. MCGINNIS.
9:15 a.m. Intestinal obstruction.
B. B. LARSEN.
9:35 a.m.—The pilonidal sinus; operative treatment (motion pictures).
W. C. FARGO.
10:00 a.m.—Pyloric stenosis in the infant.
D. M. GLOVER.
10:20 a.m.—Anomalies of the intestinal tract in the newborn.
J. G. JONES.
10:45 a.m.—Biliary fistula—subphrenic abscess—bronchial fistula.
Discussion.
11:00 a.m.

Genitourinary Surgery

C. A. BOWERS and staff.
9:00 a.m.—Urological operations.
2:00 p.m.—Urological clinic.
D. A. CHAMBERS.
2:00 p.m.—Nephrectomy in surgical hypertension.
H. B. WRIGHT.
2:30 p.m.—Treatment of vesicovaginal fistula.

JAMES LYNCH.
3:00 p.m.—Cysts of the kidney.
D. W. MCINTYRE.
3:30 p.m.—Discussion of renal tumors.
C. A. BOWERS.
4:00 p.m.—The present status of prostatic surgery.

Otorhinolaryngology

THOMAS W. THOBURN and staff.
9:00 a.m.—Otorhinolaryngological operations.
2:00 p.m.—Otorhinolaryngological clinic.
J. W. MCCALL.
2:00 p.m.—The esophageal voice in laryngectomized patients.
C. E. KINNEY.
2:30 p.m.—Results of the fenestration operation.
F. W. ALEXANDER.
3:00 p.m.—Common errors in rhinoplasty.
T. W. THOBURN.
3:30 p.m.—Management of the nasal septum tip deflection in rhinoplasty.
WARD MILLS.
4:00 p.m.—Case of double malignancy of the larynx.
LEE STONER.
4:15 p.m.—Esophageal stricture due to lye ingestion, complicated by peri-esophageal metastases of a suprarenal tumor.

Ophthalmology

M. W. JACOBY and staff.
9:00 a.m.—Ophthalmological clinic.
PAUL G. MOORE.
9:00 a.m.—Traumatic eye surgery; intraocular foreign bodies.
M. W. JACOBY.
9:30 a.m.—Traumatic eye surgery: contusions of globe, intraocular hemorrhage and secondary glaucoma.
Discussion.
10:00 a.m.
GERALD T. SCHWARZ and M. I. SPARKS.
10:15 a.m.—The albumin-globulin ratio: its relation to diabetic retinopathy.
B. J. WOLPAW.
10:45 a.m.—Visual requirements for flying (original study, Naval Flying School, Pensacola).
Discussion.
11:15 a.m.
E. F. HARVEY.
11:30 a.m.—Interesting fundus cases: a. Pits of optic nerve; b. Division of optic nerve with extensive field defect; c. Angioid streaks of retina.
Discussion.
12:00 noon.

ST. VINCENT CHARITY HOSPITAL

Tuesday

Ophthalmology

H. H. WYAND and associates.
2:00 p.m.—Nonoperative clinic.

Wednesday

General Surgery

O. A. WEBER and associates.
9:00 a.m.—Operative clinic.

Orthopedic Surgery

C. G. BARBER and associates.
9:00 a.m.—Operative clinic.

Thursday

General Surgery

Tumor clinic.
8:00 a.m.
J. E. HALLISY and associates.
9:00 a.m.—Operative clinic.

Otolaryngology

C. W. ENGLER and associates.
9:00 a.m.—Operative clinic.

Friday

General Surgery

E. P. NEARY and associates.
9:00 a.m.—Operative clinic.

Genitourinary Surgery

H. R. TRATTNER, L. F. HUFFMAN, and H. R. WRIGHT.
9:00 a.m.—Operative clinic.

UNITED STATES MARINE HOSPITAL

Tuesday

Genitourinary Surgery

D. W. MCINTYRE.
9:00 a.m.—Clinic, followed by operations.

Orthopedic Surgery

T. A. WILLIS.
9:00 a.m.—Nonoperative clinic.

CRILE VETERANS ADMINISTRATION HOSPITAL

Tuesday

WILBERT H. MCGAW, DONALD E. DIAL, N. W. THIESSEN, and VERNON L. TICHY.
9:00 a.m.—Operative clinic.
WILBERT H. MCGAW.
2:00 p.m.—Presentation of Orthopedic Cases.

Wednesday

WILLIAM C. MCCALLY, CLAUDE S. BECK, JOHN J. THORNTON, and DARRELL T. SHAW.
9:00 a.m.—Operative clinic.
WILLIAM C. MCCALLY.
2:00 p.m.—Selection of Cases for Vagotomy.

Thursday

EARLE B. KAY, PHILIP F. PARTINGTON, and CYRIL T. SURINGTON.
9:00 a.m.—Operative clinic.
PHILIP F. PARTINGTON.
2:00 p.m.—Cholangiography as a Diagnostic Aid.
VERNON L. TICHY.
2:00 p.m.—Difficulty in Diagnosis of Regional Enteritis.

Prevent INFECTION

with **MERCUROCHROME**

(H. W. & D. Brand of merbromin, dibrom-oxymercuri-fluorescein-sodium)

Extensive use of the Surgical Solution of Mercurochrome has demonstrated its value in preoperative skin disinfection. Among the many advantages of this solution are:

Solvents which permit the antiseptic to reach bacteria protected by fatty secretions or epithelial debris.

Clear definition of treated areas. Rapid drying.

Ease and economy of preparing stock solutions.

Solutions keep indefinitely.

The Surgical Solution may be prepared in the hospital or purchased ready to use.

Mercurochrome is also supplied in Aqueous Solution, Powder and Tablets.

Hynson, Westcott & Dunning, Inc.
Baltimore 1, Maryland

IMPROVE YOUR RESULTS IN CANCER OF THE CERVIX

CONSISTENTLY high percentages of 5-year cures in Carcinoma of the Cervix are reported by institutions employing the French technique illustrated here. Ametal rubber applicators encase the heavy primary screens and provide ideal secondary filtration to protect the vaginal mucosa. Radium or Radon applicators for the treatment of Carcinoma of the Cervix and provided with Ametal filtration are available exclusively through us. Inquire and order by mail, or preferably by telegraph or telephone reversing charges. Deliveries are made to your office or hospital for use at the hour you may specify.

THE RADIUM EMANATION CORPORATION

GRAYBAR BUILDING Tel. MUrray Hill 3-8636 NEW YORK, N. Y.

Printed by R. R. Donnelley & Sons Co., Chicago, Ill.